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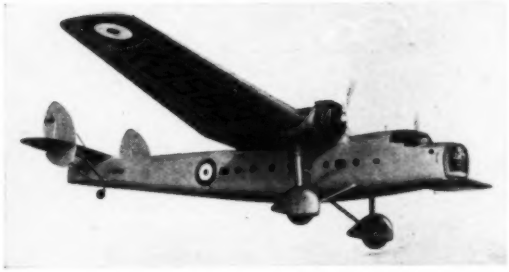

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FLIGHT

The AIRCRAFT ENGINEER AND AIRSHIPS

FIRST AERONAUTICAL WEEKLY IN THE WORLD : FOUNDED 1909

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The Outlook

The Wrong Tree

THE early part of the New Year is always a dead season, and Fleet Street is at its wits' end to find something sensational wherewith to tickle what it fondly believes to be the jaded palates of its readers. This year someone saw in the R.A.F. expansion a subject which promised fruity bits of "scandal," and obviously the Air Ministry might very suitably be made the goat. The more sensational of the dailies at once followed the lead, and the country has, during the last few days, been treated to an avalanche of allegations, totally unsupported by evidence, of inefficiency and muddle at the Air Ministry.

That there have been delays in production no one denies, not even the Air Ministry. You cannot suddenly expand a specialised industry from a few thousand workers to a hundred thousand and more without delays occurring. But to allege, as has been done, that the entire Air Ministry is merely a hampering brake on production is both unfair and stupid. The blame cannot be located and traced to a single building in Kingsway; the causes are many and varied, and are spread throughout the industry. A hold-up in the supply of any one of a hundred different parts or components may affect not one but half a dozen aircraft factories.

If the daily Press wanted to impress upon its readers the fact that aircraft production is suffering from delays, it would not have been difficult to find instances which corresponded more closely to actualities. If it had pleaded, as *Flight* has been pleading for many months, for greater simplicity in design, for a reduction in the number of materials specifications, for standardisation in many directions in which standardisation could be insisted upon without any serious loss in efficiency, the Air Ministry and the aircraft industry alike would have welcomed the interest taken in the subject of aircraft production by the dailies. By tackling the subject in the way it has been tackled the papers have left the country with an uneasy feeling that the whole industry is in a hopeless muddle and that nothing is being done about it.

There is no cause for complacency, but the trouble cannot be cured by a few changes at the Air Ministry

Sharing the Blame

AFTER a period of years during which orders were few and far between, and during which, therefore, there was time and opportunity to aim at ultra-refinement rather than at rapid production, the industry has been called upon to go on to almost a war-time production basis. The old state of affairs left a multiplicity of materials specifications, because with small production it was essential that everything should be as "good" as human skill and ingenuity could make it. The technical staffs in the industry and in the Air Ministry had grown up in that atmosphere, and when the panic expansion was forced upon them they could not be expected to change their outlook overnight.

Technical staffs had to be expanded, but where were the recruits to come from? There was no reserve to draw upon, and in most cases the newcomers to technical departments and drawing offices came straight out of school or technical college. They had no practical technical experience in other branches of engineering and, naturally, they had to be guided by those who had grown up in the aircraft industry when it was small, and when rate of production could well take second place.

For the multiplicity of materials specifications the industry must share the blame with the technical departments of the Air Ministry. In pre-expansion times a designer was justified in using the most suitable materials he could obtain, and in working them in the way which gave the greatest efficiency, even if this meant a slight increase in manufacturing time. Before a designer was allowed to use a new material it had to be approved by the Ministry, and so one specification was added to another, until the list became rather formidable. While it was only necessary to stock "two of everything," so to speak, that did not greatly matter; when it comes to stocking hundreds of everything the problem assumes a very different aspect.

One might go on quoting similar instances, but the case of materials specifications is more or less typical of them all. The fault does not lies with anyone in particular, but is a result of conditions which have now changed very materially.

The Suez Canal

THE decision to make a new and very good station for the R.A.F. on the banks of the Suez Canal is a normal and natural development. Egypt is, like Iraq, a country which has been under some sort of British protection, but has now received full independence, and has entered into a treaty with Britain. In Iraq the air squadrons are being withdrawn from the Tigris to Dhibban on the Euphrates, where an air station of the most modern description is nearing completion.

The treaty with Egypt provides that the Royal Air Force in that country shall be congregated on the Suez Canal, and may be increased in numbers. In both cases the *amour propre* of the people of the country is soothed by the disappearance of British units and British uniforms from the neighbourhood of the capital.

While, on the one hand, a station on the Suez Canal will be out of sight of the people of Cairo, on the other hand the defence of the Canal is a matter of first-class concern to Britain. Everybody knows that. It is also of great importance to Egypt that the Canal shall be kept open and safe. During the Italian invasion of Abyssinia the Egyptians were no little alarmed, and realised the importance of having a powerful friend and ally to look after their interests in that direction.

Abyssinia and Eritrea do not march with Egypt, but they are on the borders of the Anglo-Egyptian Sudan, to the interests of which Egypt cannot be indifferent. The Italian conquest of Abyssinia has decidedly complicated the international position of Egypt, and therefore she is all the more willing that the Royal Air Force should have the Canal in its keeping.

Shipping and Air Transport

SHIPPING companies in the United States are, it appears, beginning to protest against what they call the monopoly of Pan-American Airways in running air services across the oceans. One shipping firm has addressed a letter to all members of Congress stating that it is in a position to undertake the operation of large flying boats and is prepared to spend five million dollars on them. Bills have since been introduced into both houses of Congress in order to make such an action legally possible, though it must not be forgotten that P.A.A. are already in very close co-operation with the South American Grace Line—hence Pan-American-Grace Airways, or Panagra as they are more normally known. In this country the shipping interests have always watched air transport development, and, in one or two cases, have actually been connected with serious projects.

The situation has features in common with the state of affairs which brought about the formation of Railway Air Services in this country. The older forms of transport have been impressed by the progress of air travel, and now wish to use it in conjunction with either ground or sea transport. Likewise they do not wish to have aircraft as a rival to their steamers or trains, as the case may be. This new attitude is a compliment at least to the prospective success of the air transport companies, but it may create a new difficulty. In the early days of air travel its directors would have been very glad to have had the resources of established ground or sea concerns behind them; but, when they are making good by their own efforts, they naturally do not relish the idea of giving up the possible harvest.

Airship Precedent

PAN-AMERICAN have done splendid work in establishing air lines from the United States to South America and across the Pacific, but it still remains a question whether transport in general, including air transport, could not be better used for the benefit of the travelling public if some system of co-operation were to prevail.

Years ago, when annual air conferences were held in the Guildhall, Sir Alan Anderson once made a remark to the effect that if airships could only do half what was claimed for them, the Orient line at least would be willing to back them. He pointed out, if we remember rightly, that he personally had not been able to spare the time to visit Australia for a number of years. If airships could get him there and back in a short time he would not care what fare was charged.

The goodwill then promised to airships might be extended to large flying boats, which are now making voyages which did not seem possible at the time of the Guildhall conference. Imperial Airways, however, do not now need the financial backing of steamship companies, as the Governments of the Empire have adopted them as their chosen agents.

Rivalry or Co-operation

AS for rivalry, we may also quote the expressed opinion of the late Sir Alfred Jarrow, who said that if airships made good the shipping lines would benefit because all the passengers in a hurry would go by air, and therefore the shipping companies would save very large sums by building only slower ships.

Things might not work out like that in practice, and there is a long way to go before even half the travellers who now use the *Queen Mary* and the *Normandie* will prefer or be able to cross the Atlantic in a flying boat. It is also pertinent to observe that the millionaire in a hurry is not a sound source of regular profit for any air line, and that, therefore, the question of keeping fares low is still of importance.

Co-operation between air transport and surface transport will probably be for the good of both, but that is not to say that the best arrangement will be for the shipping firms to own and run the air lines—unless, of course, the Government wearies of paying air subsidies and prefers to let the shippers carry the baby. There is still the prospect that one day air lines may pay their way without subsidies.

A Mountain Test Plant?

MUCH of the work of developing the modern aero engine has been done in the firms' test houses, first on single-cylinder units and afterwards on complete engines. The need for high flying and supercharged engines brought fresh problems, and at the Royal Aircraft Establishment at Farnborough there is a plant for operating engines under conditions intended to simulate those met at heights. In the main this plant has done what was needed, but there are features which cannot be imitated completely.

A short time ago France decided to try the experiment of testing aero engines at actual instead of at imitation altitudes. She established an engine-test plant at Mount Lachat, in the Mont Blanc *massif*. The test plant is operated by the Société Nationale de Construction de Moteurs and is situated at a height of approximately 7,000ft. Mount Lachat was chosen not so much because of its altitude as on account of the intense cold frequently experienced in that district. The actual test bed is mounted on a carriage which runs on rails to the edge of a precipice, and prolonged tests in temperatures below freezing point can be made in the open without causing inconvenience to anyone except the crew!

The drawbacks of the idea are obvious enough: Long distance between works and altitude-testing plant; testing crews having to "rough it"; supplies to be stored against emergency; and so forth; but the gains to be expected in the form of full knowledge of engine behaviour at operational height and in operational temperatures should be sufficient to make the experiment worth while. The idea seems to have a good deal to recommend it and might be worth adopting in this country. Though we have nothing higher than the 4,406ft. of Ben Nevis, that inhospitable mountain can at least offer the chilliness.

DIARY OF FORTHCOMING EVENTS—PAGE 35

ANTIPODEAN RECONNAISSANCE

Anson reconnaissance-bombers of the Royal Australian Air Force in impressive array over Sydney. Combining economy with performance (a top speed of nearly 190 m.p.h. is available on about 700 h.p. delivered by two Siddeley Cheetahs), this British general-purpose type is an attractive proposition for air arms with limited financial resources.

Leading lights in the Avro concern to-day : Mr. R. H. Dobson (left), general manager, and Mr. Roy Chadwick, chief designer. A portrait of Sir Alliott Verdon-Roe, the pioneer pilot and constructor, whose name the firm bears but who is no longer actively connected with it, appears on page 36a, in an article which he himself has written.

QUARTER of aE

ONE need make no apology for applying the *cliché* "household word" to the name of the aeroplanes with which this article is concerned. "Avro" is one of the very few aircraft names well known to the general public outside the movement. For the last twenty years John Citizen and Mrs. Citizen have been apt to call any big aeroplane a "Handley Page"; and in the same way they have shown a tendency to say, "I think it's an Avro" when any smaller one has passed overhead—at any rate, when they were certain it was really not small enough to merit the description of "Moth."

And, of course, in tens of thousands of cases it has been an Avro that has given Mr. and Mrs. John C. their first taste of aviation. Even those who have never flown again recall the thrill of trepidation, curiosity, eagerness, or whatever emotion visited them as they clambered up the slipstream-blasted ladder to the tandem-seated passenger cockpit of a "504."

Thus, when the makers of that "504" (and of its forebears and descendants) proudly achieve a quarter-century of construction, as they do this week, with another five years of historic experimental work thrown in for good measure at the beginning, it is fitting that we should do them honour by recalling some of the milestones in those twenty-five years.

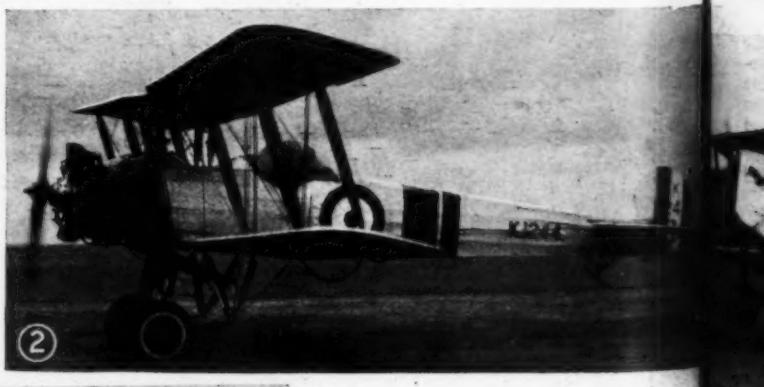
The beginnings of the firm of A. V. Roe and Co., Ltd., were in the year 1907, when a young man by the name of A. V. Roe, now Sir Alliott Verdon-Roe, followed up the construction of models by building a full-sized machine.

The romance of the early days of experiment which culminated in the formation of the company by A. V. Roe and his brother, H. V., is recalled by Sir Alliott himself in an article specially written for *Flight* (pages 36a-36d), so this review of Avro history may fittingly begin at the date on which the firm was put on its present basis. That date was January 11, 1913, and at that time the Type 500, with 50 h.p. Gnome rotary engine, had proved very successful. In fact, the 500 (illustrated on page 36c) would not look so very much out of the picture to-day. It laid the foundation for the 504, which was to become the most famous aeroplane in the world, and the designs for which were already under weigh when the company was reconstructed.

By May of 1913 the first 504 had been finished and tested; it made its first public appearance at Hendon one Saturday, when everyone marvelled at its amazing speed range (actually about 90 to 35 m.p.h.) and generally attractive appearance. It had been flown over from Brooklands by Raynham, and several of the Hendon pilots were privileged to fly it. They were unanimous in their praise of its fine qualities, but nobody could then have foreseen that, with various modifications and amendments, it was destined to be built in thousands. Compared with the 500, the first 504 had a fuselage of better streamline shape, curved side fairings and decking having been added to the rectangular-section main fuselage structure. A Gnome engine of 80 h.p. had been substituted for the 50 h.p. Gnome of the 500.

The Famous "504"

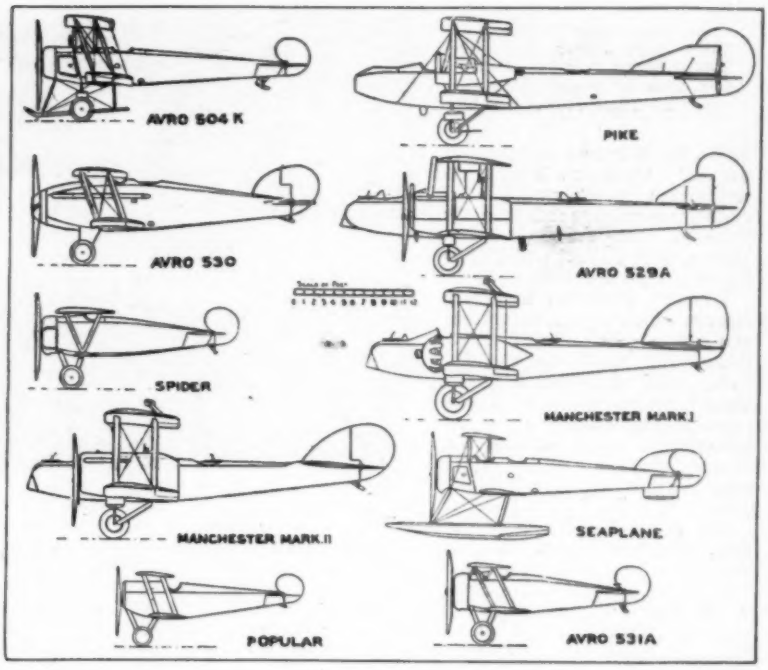
The central skid which had been a familiar feature of the 500 was retained, but instead of using a leaf-spring axle the 504 had telescopic struts with rubber-cord shock absorbers enclosed in streamline fairings. The leaf-spring axle of the 500 had always been very "squashy," and something of the same quality was retained in the 504, which may have partly accounted for its popularity for school work. Other features which appealed were the pronounced stagger and the long, slim fuselage.



SOME HISTORIC AVRO TYPES

ENTURY

The Story Behind the Name of a Pioneer Aircraft Firm which this Week Celebrates Its Twenty-fifth Birthday : Some Outstanding Avro Aeroplanes Recalled and Reviewed



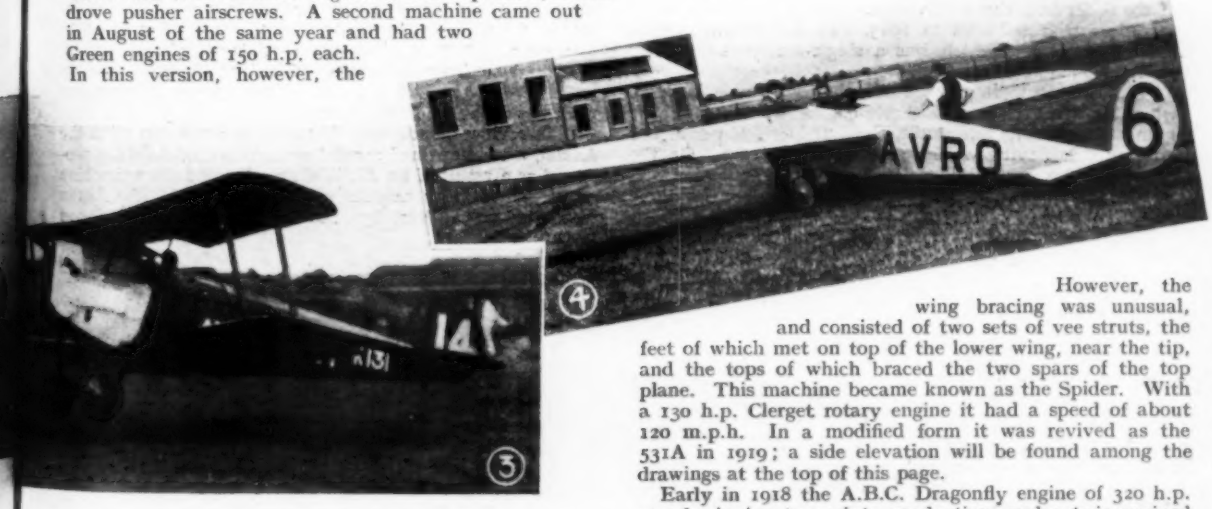
Avro productions of the war period. These side elevations, all to a uniform scale, are reproduced from *Flight* of March 20, 1919.

During the early years of the War the 504 was used for many duties, including bombing of the Zeppelin sheds at Friedrichshafen. As the years went by the difficulty of training pilots increased, and by early 1917 it had become serious. What later became famous as the "Gosport system" of training was introduced by Col. Smith-Barry, and the Avro 504 J (100 h.p. Gnome monosoupape) was chosen as the standard training type. Later the machine was fitted with the 110 h.p. le Rhone rotary, and the still more powerful Clerget of 130 h.p. With these engines the type became known as the 504 K. Later, several other versions were to follow.

Although the company had to concentrate on the production of the 504 K, they found time to design and build a considerable number of other types during the war. For instance, there was the Pike, the series number of which was the 529. Appearing in May, 1916, it was the first twin-engined machine produced by the firm. It was fitted with two Sunbeam engines of 160 h.p. each, which drove pusher airscrews. A second machine came out in August of the same year and had two Green engines of 150 h.p. each. In this version, however, the airscrews were in front of the wings. A two-seater fighter with 200 h.p. Sunbeam Arab water-cooled engine appeared in July, 1917. Known as the 530, this machine had a top speed of 118 m.p.h. The crew were seated high, looking over the top wing, and the raised top decking gave a very "modern" air.

Going through the shops at the same time as the 530 was a twin-engined three-seater bomber, the 529A, which was fitted with two Galloway B.H.P. engines of 220 h.p. each. The speed was 116 m.p.h. and the military load 1,280 lb.

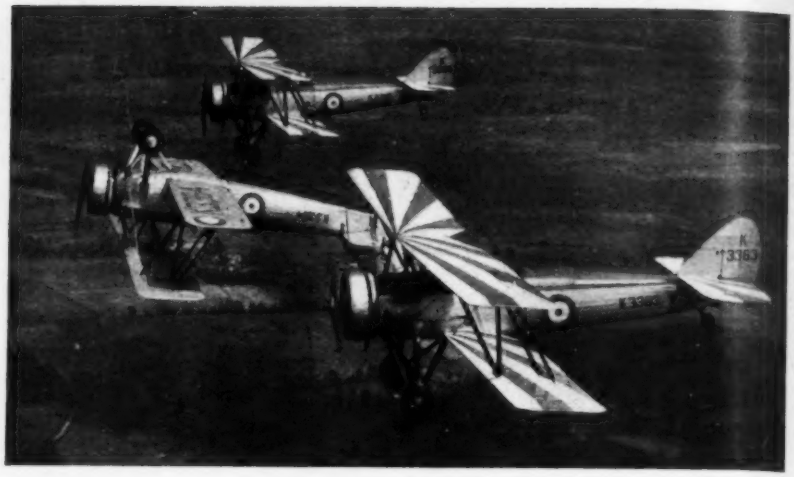
Of totally different type was the little single-seater scout which was brought out early in 1918. With a lower wing of very small chord, the 531 was slightly reminiscent of the French Nieuport scouts.



(1) The original 504 with 80 h.p. Gnome rotary engine, (2) a take-off "under the hood" by a 504N, piloted by Mr. W. E. P. Johnson. (3) The Avro Baby (35 h.p. Green) appeared in the spring of 1919 and was thus the first accepted "light plane." (4) The Avro ultra-light monoplane on which Bert Hinkler covered 1,000 miles in the Lympne week of 1923. (*Flight* photographs)

However, the wing bracing was unusual, and consisted of two sets of vee struts, the feet of which met on top of the lower wing, near the tip, and the tops of which braced the two spars of the top plane. This machine became known as the Spider. With a 130 h.p. Clerget rotary engine it had a speed of about 120 m.p.h. In a modified form it was revived as the 531A in 1919; a side elevation will be found among the drawings at the top of this page.

Early in 1918 the A.B.C. Dragonfly engine of 320 h.p. was beginning to go into production, and a twin-engined machine was designed for it. This became known as the Manchester. As the engines could not be obtained, a modified version, the Manchester Mark II, was produced fitted with two Siddeley Puma engines of about 300 h.p. each. In the Manchester the designer, Mr. Roy Chadwick (of whom more anon) used the type of aileron balance which



The modern successor of the 504 : Three Avro Tutors from the Central Flying School in formation, with the leader flying inverted. (*Flight* photograph.)

later became known as the "park bench." Used, we believe, for the first time, it was a small auxiliary aerofoil, carried on two brackets from the top of the aileron, placed above and slightly ahead of the hinge line.

When the war ended there were large numbers of 504K aeroplanes, and when pilots began to be demobilised A. V. Roe and Co., Ltd., engaged many and sent them to seaside resorts with these machines, modified to carry two passengers. It is recalled that many thousands of passengers were carried by these joy-ride pilots.

The firm may be said to have introduced the modern light aeroplane in that it produced, early in 1919, the Avro Popular, which was afterwards renamed the Avro Baby. With the identical Green engine of 35 h.p. which A. V. Roe had used in one of his 1910 triplanes, this machine was very successful. That it was more than a toy was proved by the remarkable flight made by Bert Hinkler in 1920, when he flew from Croydon to Turin non-stop in 9¼ hours.

In the ultra-light class also, A. V. Roe and Co. were early in the field, designing and building for the 1923 Lympne light 'plane competition a monoplane and a biplane, the former establishing the greatest mileage by covering 1,000 miles in the week, piloted by Hinkler.

Of military types the firm has produced a long series since the war, but space permits only a brief mention of some of the more important.

Post-war Development

In 1925 was produced the little Avenger, a single-seater fighter with Napier Lion engine, having a speed of 180 m.p.h. Among heavier types may be mentioned the Aldershot bomber with Rolls-Royce engine, produced in 1920-21, the Bison with Napier Lion in 1921-22, the Ava with two Rolls-Royce Condors in 1923, and the ambulance version of the Aldershot, the Andover, in 1924. The Avro Buffalo torpedo-carrier followed in 1925, and the following year came the Avocet, which was a single-seater fleet fighter of stressed-skin construction.

A return to light plane production was made in 1926, when the first Avian, with Cirrus engine, appeared. Large numbers of Avians were built, the first being of wood, but later models having welded steel tube fuselages. On the original Avian Bert Hinkler flew from Croydon to Australia in 15¼ days, a record which remained unbroken for three years.

The Avro Antelope day bomber was produced in 1927, and was mainly of duralumin construction, including the covering of the flat-sided fuselage. This machine might have laid the foundation for a whole series of similar construction, but in the meantime the company secured the manufacturing rights for the Fokker F.VII-3m, which had a welded steel tube fuselage and wooden wing. From it was developed the Avro Ten, and, later, the smaller Avro Five. Both were equipped with three Siddeley engines, and both appeared in 1929.

The manufacture of the fuselages for these machines gave the firm experience in welded steel tube technique, and so successful was this type considered that it was decided that, as far as possible, all future Avro aeroplanes should have this form of fuselage construction.

Replacing the 504

By 1929 the Avro 504 had been the standard training aeroplane of the R.A.F. for twelve years. Then the Air Ministry decided to replace it with something more modern, and the Avro 621 was selected after prolonged and severe testing. It went into service as the Avro Tutor, and the Siddeley Lynx was chosen as the standard power plant. A development of the Tutor was the 626, designed to facilitate training in all military duties, such as gunnery, bombing, telegraphy, photography, etc.

1933 saw several types emerge from the works. For instance, there was the Commodore, a cabin biplane intended for the private owner, and the types 642 and 652, high-wing and low-wing commercial aeroplanes respectively. The Avro 636 advanced trainer appeared the following year. It had a speed of 230 m.p.h. when fitted with the Siddeley Panther engine.

This review of post-war Avro types concludes with the Anson, a twin-engined coastal reconnaissance machine produced as a result of an Air Ministry demand for a machine developed from an existing commercial type. The Anson was based on the Avro 652, but the fuselage was redesigned for military work.

The latest Avro type, the Anson general reconnaissance machine, has a speed of 188 m.p.h. when fitted with two Siddeley Cheetah IX engines of 310 h.p. each. (*Flight* photograph.)

When fitted with two Siddeley Cheetah IX engines of 310 h.p. each, the standard power plant of the Anson, the maximum speed is 188 m.p.h. at 7,000ft., and the cruising speed 158 m.p.h. at 6,000ft. The machine carries a crew of three, one of whom is navigator and bomb aimer, the other wireless operator and rear gunner, and the pilot. Very large numbers of Ansons have been built for the R.A.F., and the type has been sold to five foreign Governments.

And now for some personal notes. Though Sir Alliott Verdon-Roe is no longer connected with the firm which bears his name, he still takes a keen sentimental interest in its products, as readers of his article will see from his reference to the future and his tribute to his "old friend Roy Chadwick."

Sir Alliott's name is perpetuated a second time in the newer Saunders-Roe, frequently contracted into Saro.

Although he has severed his connection with A. V. Roe and Co., that continuity of ideals which is so essential to success has been maintained by two old-timers who have been with the firm almost from the very beginning, and who now hold the responsible positions of chief designer and general manager respectively.

Personal Sidelights

Roy Chadwick joined A. V. Roe as his personal assistant towards the end of 1911. He thus has shared (or disputed) what may be called the man Roe doctrine since Avro aeroplanes first began to be practical flying machines, and the pioneer spirit is in him as well as in his old chief. Chadwick became chief draughtsman in 1914, and was officially appointed chief designer just after the war, although there is little doubt that he was in fact, if not in name, chief designer some considerable time before that. As such, he has been responsible for all the Avro machines subsequent to and including the 504K, and has pioneered many original conceptions. For instance, shortly after the war he designed the little Avro Baby, the first successful light aeroplane. Chadwick also designed some of the first stressed-skin aeroplanes to be built in this country, such as the Avocet and the Antelope. He was responsible for the Ava of 1923. This machine was, we believe, the largest all-steel aeroplane built up to that time. In recent times Chadwick designed the Anson, which was the first machine of the modern formula (low-wing, twin-engined monoplane with retractable undercarriage) to go into quantity production for the R.A.F.

In the early days Roy Chadwick did much flying as observer in the Avro machines when they were taken up by F. P. Raynham for experimental and test flights. Some years ago he decided that he ought to learn to fly, but discovered that he was a much better designer than pilot. . . . For years after leaving hospital and nursing home he suffered for his misdirected enthusiasm, but the experience confirmed the belief which many have held for a long time—that there are many who are good pilots but few who can design successful aeroplanes.

While Chadwick has been looking after the design side the constructional and production problems of Avros have been equally effectively tackled by the other Roy, Mr. R. H. Dobson. "Dobbie" joined the firm in August, 1914, and by the end of 1918 he had become assistant works manager. About a year later he was appointed works manager, and in December, 1934, he took over the post of general manager. In 1936 he joined the board of directors.

At the Manchester works of A. V. Roe and Co., Ltd., "Dobbie" has built more aeroplanes than he can remember. First there was the famous 504 and all its variations, combinations and permutations; in more recent times the Tutor, produced in large numbers as a training type; and during the last few years hundreds of Ansons have left the factory at Newton Heath. A start is now being made on a large batch of Bristol Blenheims, but the modern forms of construction hold no terrors for "Dobbie," even if he does not necessarily agree with them. He has his own ideas on the subject, and they are well worth listening to. Aircraft production is generally held to be one of the most worrying pastimes in which a man may indulge. Mr. Dobson has never let his troubles get the better of him, and the "Dobbie smile" seen in the portrait on p. 30 was not put on for our especial benefit. It is familiar throughout the British aircraft industry.

Under the merger which took place in July, 1935, the Hawker-Siddeley Aircraft Co., Ltd., acquired the whole of the ordinary share capital of the Armstrong Siddeley Development Co., Ltd., and 50 per cent. of the total issued ordinary share capital of Hawker Aircraft, Ltd. Among the firms controlled by the Armstrong Siddeley Development Co., Ltd., was that of A. V. Roe and Co., Ltd., so that the firm now belongs to the group which includes, in addition to those mentioned, Armstrong Whitworth Aircraft, Armstrong Siddeley Motors, and the Gloster Aircraft Co., Ltd.

CARBURETTORS in PRODUCTION

THE elementary form of carburettor is a thing of the past for medium- or high-powered aero engines, and the skill required in the assembly of the parts for a modern example (which amount in some cases to as many as eight hundred), is akin to that of a watchmaker. A visit to the works of Claudel-Hobson shows that complications of many kinds have arisen and been provided for, and now, disposed round the float chambers one finds such accessories as delayed-action accelerator pump, three-stage automatic mixture control, and automatic boost control. These automatic controls are similar in construction, having sliding valves controlled by an aneroid with either single composite or separate bellows. In the case of the boost control the aneroid chamber is connected to the induction system and for the mixture control it is open to the atmosphere.

Life for Claudel-Hobson carburettors commences in the aluminium foundry beside the works at Wolverhampton. Sand castings of L.33 silicon alloy, chosen for its strength and anti-corrosion properties, pass into the works and are roughly fettled before machining of the faces is commenced (simple covers and small alloy parts are die-cast elsewhere). From then until assembly the main casting is subjected to a multitude of drilling, boring, milling, and polishing operations, and studs, inserts and liners are fitted. Enamelling is one of the later operations prior to assembly.

Many strange shapes of cork float, some almost surrealistic in design, are to be seen and all receive the same treatment. First are applied two coats of fuel-resisting dope, having the familiar amyl acetate smell. These are followed by drilling for attachment to the brass frame. Brass tubes are inserted down the holes and the frame is then riveted on to the cork, using copper rivets passed through the tubes. Finally, no fewer than ten more coats of dope are applied. In the most recent carburettors for large engines, automatic boost and mixture controls have been cast integrally with the main casing. A cut-out for the slow-running jet, to prevent a hot engine from firing after switching off, is part of the whole, while in the choke tubes the diffusers are now a carefully streamlined bulge in the casting, in contrast to the projecting brass pipes on earlier models.

When one sees a carburettor on test under operational conditions the terrific rush of induction mixture leaves no doubt as to the need for streamlining of any projection in the choke tubes. The apparently vast petrol consumption (40-50 gal./hr.) of high-power engines as compared with modest figures for road vehicles can more easily be conceived after observing the flow of petrol from the diffusers of aircraft carburettors.

Turkey Not Out of Step

THE Turkish Government has recently introduced a Bill appropriating £1,500,000 for the modernisation and expansion of the Turkish Air Force. Probably not unconnected with this Bill is the fact that Mr. B. Stephan, who resigned his post as general manager of Fokkers in Holland two or three years ago to become technical advisor on air matters to the Turkish Government, has been asked to renew his contract, and has done so. His friends all over Europe will be glad to know that the new contract includes a provision for a tour of Europe to study the latest developments, so that they will all have a good chance of meeting "Step" during the next year or so.

PRIVATE FLYING

ECONOMICAL SPEED: The Valsts Elektrotechniska Fabrika J.12, for which Rollasons of Croydon are agents in this country. With an 80/90 Cirrus Minor engine this little two-seater cruises at 123 m.p.h. and has a maximum of 149 m.p.h. One or two minor modifications are being made to the later production machines in order to bring them into line with British C. of A. requirements. Among other interesting features the J.12 has manually applied split flaps and differentially operated slotted ailerons.

Topics of the Day

These Instruments

ONE way and another the Air Ministry appears to be getting it hot and strong. Well, perhaps they deserve it. But practically every criticism could have been (and has been) levelled at them with equal fairness years and years ago. It is only when a system has to cope with rush-hour conditions that its faults become really obvious.

However, a more recent complaint, coming this time, more or less, from the "inside"—concerning the shortage of instruments for the new machines—interested me particularly. Production difficulties were blamed, when surely it would have been fairer to blame the Service experts themselves. The new Service blind-flying panel includes free gyro instruments, yet for years the R.A.F. would not consider any instrument of this type, and the entire blind-flying training system had been built up around the simple and reliable turn indicator. This must always be included in equipment, since no free gyro instrument can work in all attitudes, and since this type of instrument is necessarily more delicate in its operation.

During the past five years practically every transport machine has been fitted with the easily used horizon and gyro, and, more recently, with a sensitive altimeter. Although I have flown in comparatively few Service machines, I have yet to see any one of these instruments in the cockpit or control cabin. More recently I have seen gaps in the panels, which would presumably be filled in due course with such devices.

I am not very sure of the patent position in the matter of free gyro instruments, but certain it is that they cannot be mass produced and that you cannot suddenly ask for a couple of thousand directional gyros, or sensitive altimeters, and expect to have them delivered to-morrow or the day after. The R.A.F. did not previously want them, so nobody prepared to make them by the thousand for the two dozen transport machines which were being built every year.

Basic Training

NOT that I suggest for a moment that the standard blind-flying training technique was wrong in conception. To-day's ideas may be different, but at the time the methods were admirable and, even now, a man who has learnt to fly under the hood with a sensitive turn indicator, an eccentrically acting fore and aft level, and a compass possessed of the natural habits of its kind, should be able to cope with everything and anything.

My instrument-flying training has been erratic, incomplete and largely self-provided, but in its earlier stages it was carried out entirely on the instrumental equipment enumerated above. Yet from the very start I have had no trouble with the more complete equipment provided on transport aeroplanes—in fact, I have usually found it rather less difficult to fly such machines on the instruments alone, since there is no nose to speak of and the wing-tips are often somewhere out of sight in the background.

During my very first essay with a twin-engined type I had to take it up through a shallow cloud layer on two instruments which were then almost entirely new to me—a gyro and an horizon. Nothing in the world seemed more easy, yet all my normal hood flying had been carried out in an oppressively self-heated atmosphere, and I always lifted the hood and sighed with relief to see the familiar horizon once again. The only part of transport blind-flying which can be considered in any way difficult or exhausting is that carried out during the last part of a blind approach—when real accuracy is essential and when several more instruments and so forth must be looked after. When complete transport training has really become commonplace, even that difficulty will be laughed aside.

Crowded Out

THE fact that transport machines are, every year, becoming faster, bigger, and, consequently, less effectively manœuvrable, will make accuracy even more essential and traffic control more difficult.

It is all very well for us to skate around an aerodrome of which the far end can hardly be seen. Our little aeroplanes can, without hesitation, be thrown about or slipped away from obstructions. The pilot of a big transport must come in along a straight line, and if another machine, a chimney, or a hangar is in his way, he must do half a dozen things before he is ready to make a second round, and is certainly not able to make a steep S-turn and to land straight off the last turn.

Only a few days ago I found myself flying around an aerodrome with seven other machines, not one of them more than half a mile away. I had some difficulty in keeping two of the nearer ones in sight all the time. One of them tried to hide behind the centre-section tank, so that it was eventually necessary to close the throttle to prevent possible destruction; another lay in such a position that I had to lift the starboard wing-tip in order to peep at him now and again. At one moment three machines were converging in front of me, and it was difficult to resist the dangerous temptation to close the throttle and try to stop for a moment or two while the situation clarified itself.

The fact was that visibility was extremely poor, everyone was trying to keep the aerodrome boundary in view on the left, and the law of averages had ordained that all seven machines should be in the air in the same place and at the same moment. But the pilot for whom I felt

particular sympathy was trundling around with us in a medium-sized twin-engined machine. He had to come in on a straight line, and had, consequently, to plan his approaches with care. The fact that there were, during the last part of an approach, three other machines within a few hundred yards below and on my left was of small consequence to me, as I could slip away from them and use, if necessary, a narrow part of the aerodrome well to the right of the normal approach line. The twin pilot had to use the aerodrome proper, and his only course of action if some Reservist landed or taxied across his bows was to open up and go round again.

Incidentally, the number of Reserve aerodromes in, or near, the Croydon controlled zone is already being a source of considerable anxiety to certain transport pilots.

INDICATOR.

FROM the CLUBS and SCHOOLS

LONDON

THE flying time for last week was 27 hr. 10 min.—most of this being carried out on the only two good days. New members included Messrs. F. R. Parker, H. Green and L. R. Langmead.

BEDFORD

The Bedford School of Flying, which makes Barton Airport its headquarters, started activities on January 1.

MARSHALL'S

An interesting feature of the week was the maiden flight of the Ladybird DB. 3 M.1, constructed at the aerodrome by Mr. J. N. Maas. Flying time for the week ended January 9 totalled 25 hr. 30 min.

BRISTOL AND WESSEX

The scholarship scheme is proving very popular and 193 pupils have already been tested. The closing date for appointments is January 31. Flying for December amounted to 32 hr. 20 min., and for the first week in January 17 hr. 40 min.

HULL

The total amount of flying for the year 1937 was 722 hours, which was rather disappointingly lower than that for 1936. Bad weather conditions which persisted throughout December were responsible for the low total of 15 hours for the month.

HANWORTH

The annual general meeting of club members was held at the Aerodrome Hotel on Wednesday, January 12, 1938, at 7.30 p.m. Mr. F. H. Hill has completed his "A" licence tests and flying for the week ended January 6 amounted to 43 hr. 5 min.

YORKSHIRE

The flying total for 1937 was the excellent one of 1,955 hr. 55 min., and during the week ended January 7, 1938, 23 hr. 20 min. were logged as compared with 28 hours for the whole of January, 1937. A dance was due to be held in the clubhouse on January 8.

BORDER

Despite the rather unfavourable weather the year has started quite well and 19 hr. 35 min. was spent in the air during the week ended January 8. Levelling work on the airport is in progress and it is quite a forced landing competition to avoid the numerous red and yellow flags. Several new members were in evidence.

NEWCASTLE

The annual dinner and dance is to be held at the Royal Station Hotel, Newcastle-upon-Tyne, on Friday, January 21, 1938. Application for tickets should be made to the Hon. Secretary, Woolsington Airport. Of the flying total of 22 hr. 35 min., 14 hr. 20 min. represented solo. Six new members joined during the week.

NORTHAMPTON

Although the weather conditions still hold up flying, there is a steady increase in new members. The New Year's Eve dance was a great success and the annual dance on January 28 should prove as popular.

C.A.S.C.

In spite of high winds members flew on Sunday for 7 hr. 35 min. At the annual general meeting the following elections were made to committee: I. R. Mascall (Commanding Officer); S. A. Dew (Asst. Commanding Officer); J. Arrow (Treasurer); R. T. Dew (Secretary); A. Drew (Quartermaster); A. Guest (Librarian); S. A. Dew (Transport); R. A. Carter (Publicity).

NORFOLK AND NORWICH

Further headway is being made with the two enterprises recently launched by the Norfolk and Norwich Aero Club, namely, the trade scholarship scheme, which Messrs. Mann, Egerton & Co., Ltd., have so generously backed up, and the gliding section. Gliding was rather handicapped by the weather, but Flt. Lt. F. T. K. Bullmore was very busy testing applicants for the scholarship scheme. Mr. A. R. Goodley has passed his "A" licence tests.

SCOTTISH

The bad weather experienced during December meant that very little flying was possible, the total for the month being 30 hr. 10 min. Mr. S. Baxter made his first solo flight. The Club entertained some seventy children at a party on January 2 in the lounge, and Miss 1938 distributed presents after she had arrived by air. After tea the children were entertained by Bertha Wardell and her Children's Theatre, and the party ended with a firework display. A similar party was given to a hundred Renfrew children on January 3.

CINQUE PORTS

Considerable activity is in evidence now that the club has returned to normal after being closed for the holidays over the New Year. First solos were made by Messrs. A. L. Bagshawe, R. A. K. Roberts, and E. P. Weinberg, whilst Capt. Miles Speer, Messrs. E. P. Weinberg and H. Harding have now successfully engineered their "A" licence tests. Flying for the week amounted to 40 hours, 28 of which were flown during the week-end. The QBI conditions at Croydon caused, as usual, an influx of Continental air liners.

BROOKLANDS

The demonstration of the Chilton monoplane by its co-designer, the Hon. A. W. H. Dalrymple, who flew it from Reading, was of great interest to the members, many of whom were privileged to fly it. With the intention of increasing interest and giving "A" licences something to work for, it has been decided that marks will be allotted on handicap to each competitor on their performance in the club competitions and the member claiming the highest aggregate on the year's events will be adjudged club champion for 1938. Other awards for good flying are also being considered. Flying totalled 56 hours last week.

Forthcoming Events

January 14. Strathtay Aero Club Annual Ball.
January 18. R.Ae.S. Students' Section Lecture: "Turbulence and Skin Friction," by Mr. A. A. Hall.
January 19-21. Aerodrome Owners' Association: Airports Conference, London.
January 20. R.Ae.S. Portsmouth Branch Lecture: "Aircraft of the Future," by A. Hessel Tiltman.
January 20. R.Ae.S. Coventry Branch Lecture: "Installation of Aero Engines," by Dr. G. P. Douglas.
January 25. R.Ae.S. Isle of Wight Branch Lecture: "Bird Flight," by Capt. J. Laurence Pritchard.
January 26. R.U.S.I. Lecture: "Imperial Air Routes," by Lieut.-Col. H. Burchall, Royal United Service Institution, 3 p.m.
January 27. R.Ae.S. Discussion*: "High Wing Loading and the Three-Wheeled Undercarriage."
January 28. Northamptonshire Aero Club: Annual Ball at Salon de Dance, Northampton.
February 3. R.Ae.S. Lecture*: "Recent Research on Aerodynamic Characteristics," by Mr. E. F. Relf.
February 9. York and Leeming Flying Club: Annual dance, Grand Hotel, Harrogate.
February 10. R.Ae.S. Portsmouth Branch Lecture: "Cowling and Cooling of Radial Engines," by Dr. G. P. Douglas.
February 11. D. H. Aeronautical Technical School: Annual Dance, Hyde Park Hotel, 9 p.m.
February 17. R.Ae.S. Coventry Branch Lecture: "Aircraft Motive Power," by Major E. F. Green.
February 17. R.Ae.S. Lecture*: "Maintenance of Civil Aircraft," by Mr. H. L. Hall.
February 21-March 4. British Industries Fair.
February 25. Hampshire Aeroplane Club. Annual Dinner and Dance, South-Western Hotel, Southampton.
March 3. R.Ae.S. Lecture*: "Riveting Methods in Germany," by Dr.-Ing. W. Pleines.
April 7. R.Ae.S. Lecture*: "The Manipulation of the Boundary Layer," by Mr. E. G. Richardson.
April 21. R.Ae.S. Lecture*: "Factors Controlling the Development of Electrical Ignition on Aero Engines" by Dr. G. E. Bairstow.

* All these lectures take place at the Institution of Mechanical Engineers, Storey's Gate, St. James's Park, London S.W.1., beginning at 6.30 p.m.

HERE and THERE

Sky Broadcasts

BROADCASTS from aeroplanes in flight, received and rediffused for entertainment purposes, are no novelty, but the technique is being improved. (Which, if our recollection of hearing an air-borne dance-band does not play us false, is either a good or a bad thing, according to how one reacts to such entertainment.)

From America comes the news that United Air Lines, after many years of experiment, have acquired an aircraft transmitter which enables them to transmit a programme for rebroadcast from any location in the United States without the use of local pick-up facilities.

They demanded that the equipment be capable of transmitting a usable signal for a distance of two thousand miles. Bendix Radio Corporation designed and built a transmitter fulfilling these requirements. The equipment was capable of a power output of 100 watts, using a frequency range from 2,790 kc/s to 12,862.5 kc/s. The equipment was built into a rack which could easily be adapted for installation in any modern transport aeroplane. The transmitter was quartz crystal-frequency-controlled, and was capable of one hundred per cent. modulation.

The primary source of power supply was a bank of five 12-volt batteries, which enabled the equipment to be operated at full power for one and a half hours. The high voltage for transmitter, receivers and speech input equipment was secured from two dynamotors.

The first practical use of the equipment was made early last spring when six programmes were broadcast over the N.B.C. Network from positions over the National Parks in the West, and satisfactorily picked up and rediffused from a station in California.

America Honours British Scientist

THE Royal Aeronautical Society has for many years held an annual Wilbur Wright Memorial Lecture. It may seem a little curious that the land of their birth has not hitherto honoured the Wright brothers in similar fashion. This, however, has been due to the absence, in the United States, of an institution comparable with our R.Ae.S.

A few years ago, however, there was founded the Institute of the Aeronautical Sciences of America. This body corresponds closely to, and is very largely moulded upon, our R.Ae.S., and at the first "Honors Night" of the Institute, held in New York on December 17, the first Wright Brothers Lecture was given by Professor B. Melvill Jones, of Cambridge. Its title was "Boundary Layer Experiments in Flight."

Prof. Melvill Jones in flying kit. (*Flight* photograph.)

The honorary fellowship of the Institute was presented to Professor Melvill Jones "for contributions to the science of aeronautics, for introducing conception of the streamlined aeroplane, and for his full-scale research on boundary layer flow."

Only one American and one foreign honorary fellowship may be given each year. The other recipient in 1937 was Mr. Glenn L. Martin, "for his outstanding achievement in the construction of notable aircraft of all types."

The Institute's Guggenheim Medal was awarded to Dr. Hugo Eckener, "for notable contributions to transoceanic air transport, and to international co-operation in aeronautics."

The Sylvanus Reed Award was given to Mr. Eastman N. Jacobs (on the staff of the American N.A.C.A.) "for his contribution to the aerodynamic improvement in airfoils used in modern military and civil aircraft," and the Lawrence Sperry Award went to Mr. Clarence L. Johnson, "for important improvements in the aerodynamic design of high-speed commercial aircraft."

Mr. Johnson, it may be explained, is in charge of Lockheed research and recently completed tests of the type 14, which is claimed to be the fastest commercial aeroplane in the world.

An Air Ministry Move

THE Department of the Air Member for Research and Development, including the Director of Technical Development and his staff, is now accommodated at York House, Kingsway, London, W.C.2.

A Dutch "Air Pilot"

QUITE recently a new edition of the *Gids voor Luchtvarenden* (Guide to Air Navigators) has been published by the Aeronautical Service side of the Netherlands Department of Waterways. This guide covers much the same ground as that covered by our *Air Pilot*, but is a good deal more compact, and photographs of each aerodrome and landing ground, as well as maps printed in four colours showing their general location and details, are reproduced.

The book is in loose-leaf form with the alphabetically arranged illustrations and diagrams, with the information for each aerodrome segregated so that replacement is simplified. It is obtainable from Dienst der Nederlandsche Staatscourant (Postrekening No. 39500), The Hague, at a price of fl. 5.50; the subscription for the supplements service is fl. 1.50.

Dumfries Works and Isotta Engines

A STATEMENT made recently that the reason why the Heathhall engineering works at Dumfries had closed down was due to lack of skilled labour was officially denied recently by the directors of High-Powered Aeronautical Engines, Ltd., the present owners of the works.

They state (writes a correspondent) that the main reason was the lack of encouragement from the Government. As regards labour, they knew of no place where the position was so happy. Since starting the works fifteen months ago they had had no fewer than 2,500 applications for employment. Many of these were from old employees of the former Arrol-Johnston Motor Co. It was rather astonishing that such a place should be empty under the present state of trade in Britain, and it was hardly understandable that the Government should proceed to build new works in the shape of shadow factories when such works as these were available for the purpose. They were as suitable for the manufacture of the products now being made in the shadow factories as were the Government factories themselves.

"In an effort to get these works going all the high officials of the Government were approached, but we failed to get them interested," continued the directors. "Right from the inception the Air Ministry gave no encouragement to our original intention of making Isotta-Fraschini engines. The Air Ministry are to be admired for the stand they took, as right from the start they made it perfectly clear that they could not entertain the use of this engine. The same, however, cannot be said for the Admiralty."

They then went on to explain how they had been disappointed at the outcome of lengthy negotiations concerning the use of these engines for special motor boat work. They concluded: "The present directors are not financiers. They are simply technical people brought to carry on the works, and it is with regret they have seen their hopes thwarted and their labour lost. The works are now for sale."

NEXT WEEK: AIRPORTS

NO Airports Exhibition is being held this year by the Aerodrome Owners' Association, but the Airports Conference will take place as usual, and delegates from all over the country will come to London next week to hear papers read by experts on various aspects of the subject.

The Conference takes place on Wednesday, Thursday and Friday, and coincidentally with it, on Thursday, "Flight" will publish its Annual AIRPORTS NUMBER. This considerably enlarged Special Number will in many ways fill the gap created by the absence of an Exhibition, for the latest developments in airport construction, operation and maintenance will be discussed in detail.

Specialists will deal with particular aspects, Manufacturers' new Equipment will be described, and there will be a graphic, fully illustrated review of the world's leading airports.

NEXT THURSDAY — FLIGHT — JANUARY 20

A Pioneer Remembers

Sir Alliott Verdon-Roe, in This Article for "Flight," Looks Back on his Thirty Years of Aircraft Building

Sir Alliott Verdon-Roe as he is now—a very characteristic impression. (*Flight* photograph.)

IT was in September, 1907, that I took the first Avro aeroplane to Brooklands, where a prize of £2,500 was being offered to the first aviator to fly round the course. The manager permitted me to erect a shed alongside the judges' box on the Finishing Straight.

This first effort was built on the lines of my model which received the highest award at the *Daily Mail* model competition held at the Alexandra Palace in April, 1907. The machine was fitted with a very large front elevator which could be warped or tilted, being controlled with a single steering column. This column was twisted for warping and tilted up and down for altering the angle of the elevator.

I took out a patent for this control in 1906, this being the first patent application in the world combining the dual movement in one control column. About a year later Esnault-Pelterie took out a patent for a much cruder arrangement, as two separate sticks were used, one being controlled by the right hand and the other by the left. Apparently unaware of my previous patent, Esnault-Pelterie considered he had a case for infringement and a right to claim damages against me for using the joystick control on Avros, for after the War I received a letter from him claiming £1,000,000 from me personally. According to his estimate, a reasonable royalty per Avro would produce this sum on account of the large numbers that were built.

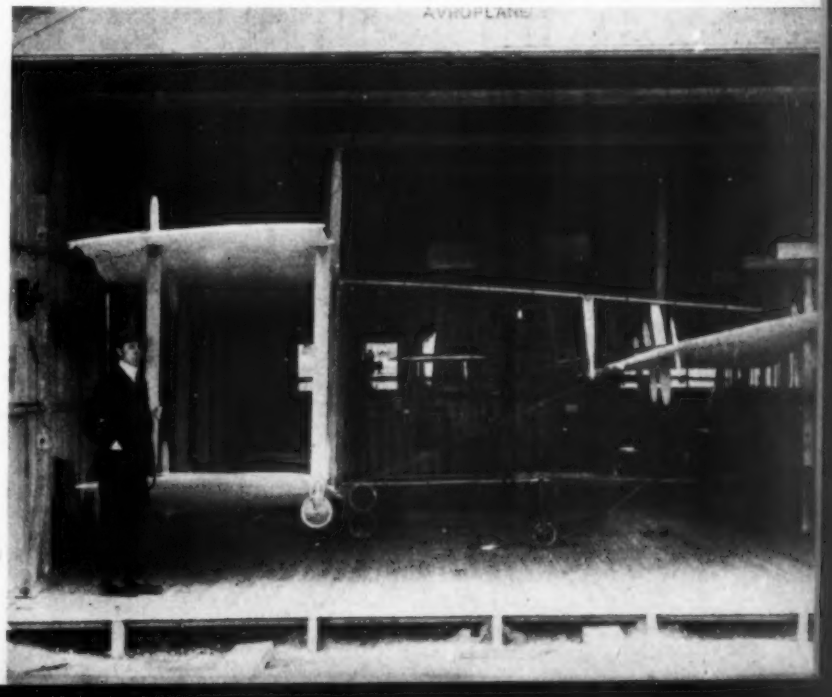
As it was a matter for the Air Ministry to deal with, I handed the letter over, together with a copy of the 1906 patent specification. I contended that there was not sufficient subject matter, in view of my prior claim, to constitute infringement

I still have some parts of this machine among my aeronautical collection, kept at home in a large cupboard with glass doors. The parts are interesting, as modern methods were employed in fashioning some of them. For instance, rigidity was obtained when using thin sheet metal by curving the free edge and generally taking advantage of curvature and double curvature. Hollow rivets made from copper tubing were used in places

The beginning of it all—"A.V." and one of the models with which he won prizes in 1907 or so

Suitable strainers were unobtainable at that period so I made my own, using cycle spokes, cut down to within three inches of the head and rescrewed, nipples and a fork being cut out of sheet metal. This was the birth of the Avro strainer, which I subsequently tried to persuade the War Office and Admiralty to take up, but without success. I think this was before there was an Air Ministry.

However, during the War the aircraft industry was held up owing to the difficulty of obtaining delivery of the more costly standard strainer. We were then given orders to provide our strainer, the Avro, and made them by the million, selling them considerably cheaper. They could be used direct on levers, and thus save the costly machined fork end or separate links. Chobert took the patent rights in France, where they were universally used. We made



The first full-size Avro. The machine was a pusher and "tailless," all directional control being by the tilting and warping front elevator. The design was based on earlier flying models such as that shown at the top of the page (*Flight* photograph.)

(Left.) Flying in 1908-09 : "A.V." piloting one of his early triplanes with J.A.P. engine. The contemplated duration may be gauged from the size of the streamline petrol tank

(Below.) How it frequently ended. The smile indicates that the pioneer became a philosopher quite early in his career. The metal airscrew looks pretty much as does a modern one after a crash.
(*Flight* photographs.)

over £40,000 per annum profit on the Avro strainer for several years.

This first machine was mounted on four small wheels, specially designed for use on the Brooklands Finishing Straight. The front wheels could be steered with the legs, which is rather interesting in view of the modern tricycle undercarriage. The 9 h.p. J.A.P., the first engine fitted to this machine, was not sufficiently powerful, although it gave me opportunities of testing propellers and taxying. Early in 1908 a 24 h.p. Antoinette engine arrived, and on June 8 I managed to make several flights, according to witnesses, of from 75 to 150 feet, a few feet off the ground. These were really the first flights in England, although the first official one was not until nearly a year later.

The First Tractor

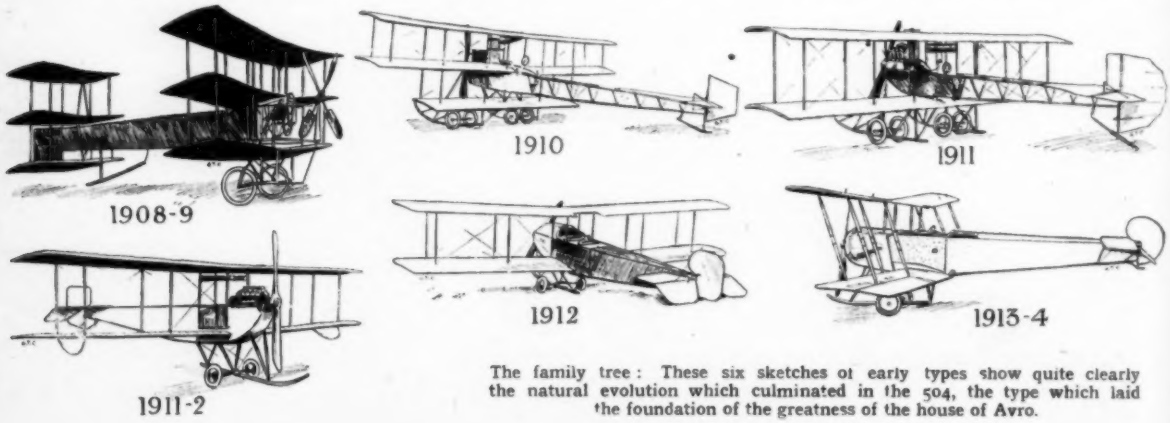
I soon became dissatisfied with this machine, because it could obviously be improved upon. So when I received notice to leave the track soon after my effort on June 8 I decided not to spend any more time on this machine and to devote all my attention on building a small tractor triplane, which I did, and took to Lea Marshes early in 1909. I managed to make a number of small flights on this machine, fitted with a two-cylinder 9 h.p. J.A.P. engine, and subsequently with a 14 h.p. four-cylinder J.A.P. engine at Wembley Park, now difficult to recognise.

The triplane had some novel features. It was designed originally to have the angle of both the main plane and tail adjustable, but trials were carried out with only the main planes controlled for warping and angular adjustment. The latter method was revived recently in the "Flying Flea." There are certainly advantages in being able to keep an aeroplane horizontal during take-off and landing and controlling the front plane.

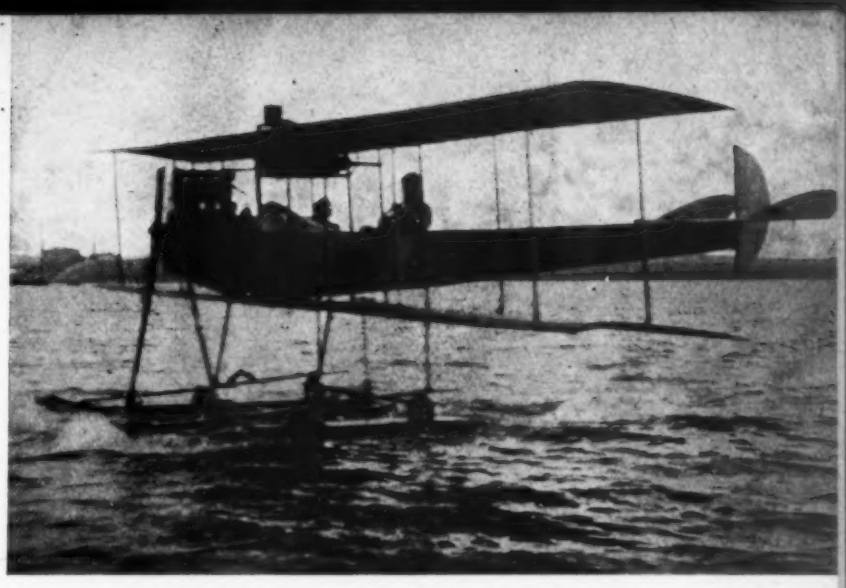
As my savings were coming to an end, my brother H. V. came to the rescue, and we formed A. V. Roe and Co., Ltd., with Colonel Grimble Groves as our first chairman—a kindly and charming man, well-known in the Manchester district. Very unfortunately he died soon after the company's inception.

For a start, we built triplanes at my brother's quaint mills—Brownsfield Mills, Manchester. In 1911 we turned our attention to biplanes. I also designed an enclosed monoplane, which was flown by Lt. Parke, R.N., early in 1912, being the first enclosed monoplane in the world to fly. We also built a biplane version of the enclosed monoplane, which was flown by Lt. Parke in the 1912 Military Aeroplane Trials on Salisbury Plain, when he did his famous spinning nose dive, just coming out in the nick of time after trying all sorts of manœuvres.

However, enclosed machines did not appeal at that time, so I designed a "clean" biplane fitted with a 50 h.p. Gnome, a number of which we supplied to the Government. I thought it was about time we gave our machines a type number, as I did not consider our early efforts as serious ones. Neither had we kept account of the number we had built. Therefore, it seemed we might as well start at a respectable number with the first serious effort, which I think was the enclosed monoplane; so we called it the 500. It must have been at the end of 1912 that I designed the 504, and I have the original drawing in the safe at home. This machine was first seen in public at a Hendon meeting in 1913, and created quite a sensation when Raynham showed that it was one of the fastest machines there and



The family tree : These six sketches of early types show quite clearly the natural evolution which culminated in the 504, the type which laid the foundation of the greatness of the house of Avro.



Early seaplane work: A 1911 biplane with 35 h.p. Green engine, flown by Commander Schwann at Barrow. (*Flight* photograph.)

yet could crawl round the course slower than any other machine. Several people said we ought to sell lots of them. I thought we would be lucky to get an order for half a dozen. Raynham also attracted a considerable amount of publicity by gliding from Hendon to Brooklands, arriving several thousand feet up.

The late Mr. John Lord became greatly interested in our aircraft venture, although he was in partnership with my brother H. V. in Everard and Co. at Brownsfield Mills. However, gradually John Lord spent more and more of his time with the Avro concern until he deservedly became one of the best-known and most popular members of the aircraft industry.

About this time we fitted a pair of floats to an Avro biplane which we had supplied to Commander Schwann at Barrow, and this machine made the first flight off water in England. We also supplied Germany with a seaplane, which was the first machine to fly from Germany to Heligoland. They built a number of machines very like it and used them during the Great War, which broke out shortly afterwards.

The War prevented the *Daily Mail* Seaplane Race round Britain, for which they were offering a £5,000 prize. We had entered a machine, and war was declared by England on Germany the day I arrived at Calshot in preparation for the race. I was given a cheque for the machine by the Commanding Officer, now Air Marshal Sir Arthur Longmore, D.S.O. This seaplane was fitted with our streamline-rear-end floats, which reduced the shocks on landing; so we were not pleased to see them changed for what we considered were inferior ones with flat backs which hammered badly when alighting on rough water.

The Gosport System

Colonel Smith-Barry and his staff developed an intensified form of training at the Gosport Aerodrome, using Avro 504's. This convinced the powers that be of the suitability of this machine for training purposes—so much so that Lord Weir, when speaking at Newcastle of war experiences, said that they found the timber question very difficult at one period, as the Avro training machine was absorbing about one-third the total supply of aircraft timber, and consequently they had to consider seriously the use of metal.

By this time it was becoming obvious that we required much larger works. Fortunately or unfortunately, Mather and Platt had just completed a huge new extension to their works close to our factory, and as they did not think they would require this new building we rented it from them. I did not relish the idea of being in a rented works. I thought that the Navy would more or less go into the air and that flying boats would be used extensively for linking-up the Empire; I conceived the idea of establishing modern new works and a garden city of our own for employees somewhere on the south coast, where we could build aeroplanes or flying boats, or both, according to the demand, and our employees could breathe God's fresh air.

So my wife and I motored round the Southampton district, and as soon as I saw the very large field at Hamble, on Southampton Water, I said: "This is our spot." I wired for one of my co-directors to come down and see it. Within a fortnight we had bought the field and a mile of foreshore, well over 100 acres in all; subsequently, we bought about another 200.

We obtained the services of Mr. Harry Fairhurst, the well-known Manchester architect and artist, to design the Hamble works and garden city or, rather, village, containing some 350 artistic houses. We only got as far as building twenty-four of these and then had to give up the scheme at Hamble, as all available building material was required for Government projects, such as the Rolling Mills and Eastleigh Aerodrome. So we had to be satisfied with using Hamble as an experimental establishment.

This dream of mine failed to materialise, as others have done; but one gets a great kick out of life by working for ideals, especially if they are for the benefit of mankind.

Real Expansion

It was most desirable that we should have works of our own, so we decided to buy a piece of triangular-shaped land alongside the Mather and Platt extension that we were occupying. This land was bordered by a railway on one side and roads on the other two. The snag was that a valley stood in the centre and that many thousands of tons of earth would be needed to fill it in. As a local tipping-ground was badly required we decided to buy the site, and for many weeks strings of carts and lorries were tipping earth and rubbish into the yawning chasm.

When it was decided to order large quantities of Avro 504's about eighteen sub-contractors were chosen. I wanted to place parts out and to have four erecting stations: two of our own, one in Manchester and the other at Hamble; one operated by Brush Electric at their Loughborough (Leicestershire) works, and one by Grahame-White at Hendon. The rest of the sub-contractors would make parts. But they were all against it; the excuse being that a general parcelling-out of erection would be safer in case of being bombed; actually, of course, they thought it a

1912 at Brooklands: The Avro 500 (50 h.p. Gnome rotary engine) from which was developed the 504. Mr. F. P. Raynham did a lot of flying on this machine. (*Flight* photograph.)

Early closing: The Avro enclosed monoplane with 50 h.p. Viale engine was produced in 1912 and flown by Lt. Parke, R.N. This *Flight* photograph is the only one in existence of the monoplane in flight.

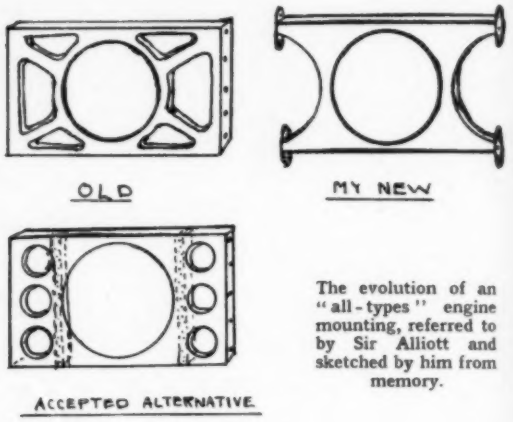
good chance to enter the aircraft industry. It took a year to deliver the first machine and, naturally, the most popular ones were those that were built by ourselves.

At the time at which the 504 was ordered in quantity it was found necessary to alter the engine plate so that it could take the various types of engines by employing adaptor rings. I thought this was an excellent opportunity to redesign the plate, which had a number of triangular lightening holes with small-radius corners which sometimes used to crack on flanging.

So I submitted a very simple design, cutting out the neutral axis as far as possible, producing a very light and strong plate. There were only four simple flanges, the top and bottom ones going straight across as before and being carried as close as possible to the central hole for taking thrust. The other two flanges were carried in two half-circles on either side of the central hole, so that the thrust was also carried direct to the struts and, as they were of large radius, it was feasible to have deep flanges.

However, the official attitude was dead against my design, and an alternative one was introduced which consisted of three small flanged round holes vertically disposed on either side of the central hole.

I attended a meeting at the Hotel Cecil, which was being used by the Air Ministry, and was popularly called Hotel Bolo. There must have been quite a dozen experts, some representing the different Services by their various-coloured uniforms. I remember a R.N.A.S. officer saying: "My experience shows that the struts on which the engine mounting is attached becomes saturated with oil, and I do not think there would be sufficient bearing surface." I pointed out that only a small part of the flange on the existing mounting was in contact with the strut, owing to the flange giving locally at the bolts; and that, generally, the blade of a pocket knife could be inserted between the flange and strut midway between the bolts. I also pointed out that the plate would "diaphragm" (this was subsequently cured by riveting vertical "U" flanges on either side of the central hole). The discussion eventually resulted in the production of an engine plate about twice as heavy as mine; and there was practically nothing in it on the load deflection test.



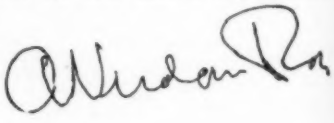
The evolution of an "all-types" engine mounting, referred to by Sir Alliott and sketched by him from memory.

During the War we developed several types of machines, including a small single-seater scout, a very clean two-seater fighter biplane, twin-engine biplanes, and a large bomber fitted with the first 1,000 h.p. engine, a Napier.

After the War we spent a lot of money developing joy-riding and civil aviation. We were one of the first concerns, if not the first, to carry passengers and run services, which found work for a number of R.A.F. ex-officers and mechanics. We carried some 30,000 passengers.

In 1928 I sold my interest in A. V. Roe and Co., Ltd., and with John Lord took over S. E. Saunders, Ltd., of Cowes, which name was changed to Saunders-Roe, Ltd. They are, of course, makers of Saro flying boats and plywood, and also marine craft.

All aircraft concerns realise the importance of "clean" construction, so we must expect to see better and better performances. In this connection I would not be surprised to see the old firm issue a super-machine before long. If anybody can produce such an aeroplane, my old friend Roy Chadwick can.



"HOME-GROWN" ALLOYS FOR AUSTRALIA

IN the near future the production of aluminium aircraft alloys will be inaugurated in Australia. An announcement to this effect was made by Sir Colin Fraser, chairman of the Electrolytic Zinc Co. of Australasia, Ltd., at the annual meeting recently in Melbourne.

A small shareholding has been acquired in the Imperial Magnesium Corporation Ltd. of Great Britain, and it is hoped, with the assistance of that company, to embark on the production of alloys in Australia. British Aluminium (Australia) Pty., Ltd., has been registered, and when Sir Alexander Stewart, chairman of the new proprietary company, returns from England, it is expected that rapid progress will follow.

These announcements come at an interesting time, in view of Australia's newly acquired aircraft manufacturing facilities. It is reported that Commonwealth Aircraft Corporation Pty., Ltd., Melbourne, are commencing the construction of the forty machines which they have contracted to supply to the Defence Department.

Messages recently received announce that the Pratt and Whitney engine division of the United Aircraft Corporation has licensed the Commonwealth Corporation of Melbourne to manufacture the Wasp. Wing Cdr. Wackett and other Australian experts have been abroad for some time studying the manufacture of this type.

Some Recent Books (contd.)

life, becomes easily understandable to the reader of his very notable book, which deals in detail with both the failures and the successes of the various Zeppelins since Count Zeppelin's earliest experiments. And some of the successes were remarkable. How many people to-day realise that *before the war* " Delag," an associated concern of the Zeppelin company, was operating regular commercial services ? With hangars at ten towns five airships were flying on regular routes and tickets were obtainable at any office of the Hamburg-America line. Altogether 1,600 flights were made, the ships spent 3,200 hours in the air, 100,000 miles were flown, and 37,250 passengers were carried, without a single accident.

Capt. Lehmann's story of the war years is, of course, a vivid one, for he himself led many of the raids on England. Another point which the book brings home is the valuable services which the Naval Zeppelins rendered to Germany by duties other than raiding. On naval co-operation work, for instance, the L.5, assisting minesweepers, sighted and marked 368 mines in the North Sea in a single day. Then there was the L.59, which was specially fitted out to go to the relief of Lettow-Vorbeck's troops, who were hard pressed by the British in East Africa, and who were in dire need of medical and other supplies. The preparation of the airship was typical of German thoroughness. The cotton envelope was to be made into tents and uniforms. Sleeping bags were to be cut from the gas cells and shirts from the linen partitions. The duralumin framework was to be used for building quarters and a radio station, which would be powered by the ship's five Maybach motors. The catwalk was made of shoe leather, and, in fact, almost every part of the craft was designed for some share in the ultimate purpose. In addition, the cargo was an enormous one, including such items as 311,900 boxes (rounds ?) of ammunition, 230 machine-gun belts, 30 machine guns and 61 sacks of medical supplies

In November, 1917, under the command of Lieut.-Cdr. Ludgwig Bockholt, the L.59 flew 2,800 miles non-stop towards her goal; but near Khartoum she received this terse message from the German Admiralty: "Abandon undertaking and return . . . stop . . enemy has occupied great part of Makonde highland and is already at Kitaugari . . . stop . . . remainder of troops attacking Portuguese from the south."

There was almost a mutiny on board, so keen were the crew to complete the task; but Bockholt was too good a sailor to disobey orders. By the time she reached her base the ship had flown non-stop for 95 hours, covering 4,225 miles.

In the chapters dealing with the raids on Britain, Capt. Lehmann speaks constantly of the efficiency of our A.A. guns, which had so often been alluded to as a sort of harmless joke :

"But the anti-aircraft batteries on the ground shot at the tremendous target with rare accuracy and sent one shell after another crashing through the body of the ship. Four aft gas cells were slashed to pieces. All bombs had to be dropped immediately."

The stories of the commercial operations of the Zeppelins in recent years are equally engrossing, though there is a rather irritating lack of chronological arrangement, the chapters jumping backwards and forwards over 30 years in bewildering fashion

" Kelly's Post Office London Directory, 1938." Price 55s. and 70s. (according to binding). Published by Kelly's Directories, Ltd., 186, Strand, London, W.C.2.

APART from recording some 700 changes of London street names, the 1938 Directory has several new entries in the classified business section A directory of " Air Raid Precaution Contractors and Consultants," and another of " Airways Provision Merchants," are two examples.

" Guide du Tourisme Automobile et Aérien au Sahara," price 25frs. Obtainable through Shell-Mex and B.P., Ltd., Shell-Mex House, Strand, London, W.C.

PROBABLY the only book to contain such information, the Shell Guide to tourists in the Sahara contains maps and routes, notes on each town and village, and details of the accommodation. A town plan is given in many cases, showing the landing ground and the position of the refuelling station. Some places can supply oil and petrol, some only oil, and for those which have no facilities directions and time taken to obtain supplies are stated.

" Aero and Auto Engine Facts and Data," by H. R. Langman; price 2s 6d., The Technical Press, Ltd., 5, Ave Maria Lane, London, E.C.4.

AN excellent little book in which the author succeeds in explaining in a simple and easily understandable manner the theory of internal combustion engines and the connected formulæ. In parts the explanations are made with note-like brevity. Discussions of cooling problems and the different valve systems are included and the electrical and fuel questions are well treated. A great deal of useful data is to be found.

TRICYCLE UNDERCARRIAGES FOR R.A.F.? Flt. Sgt. Andrews, who was responsible for assembling most of the "historic" aircraft seen at the last Royal Air Force Display, snapped at Brooklands on another kind of antique. (*Flight* photograph.)

Retired, But Busier Than Ever

AFTER some thiry years of active aircraft construction and design, Sir Alliott Verdon-Roe (an article by whom appears in this issue) has decided to place himself on the semi-retired list, and has resigned from the post of chairman of Saunders-Roe, Ltd. That is not to say that he no longer takes an interest in the firm. He is still a director and the president of the company, and will continue in an advisory capacity.

It is typical of "A.V." that he has taken out more patents during the last year or so than ever before in his career; nor are they all confined to aircraft, but include new hull shapes and propelling gear for high-speed motor vessels. "A.V." shares with that other inventive genius Edison an ability to do with very little sleep, and he says that as he grows older (few will believe that he does) he finds that he can do with less sleep. An average of six hours a night has sufficed him during the last year. No wonder he finds time to do so much.

Protecting Operatives' Skins

AN antiseptic compound, *Sternocleanse*, has been produced by a well-known firm of lubricant manufacturers for application to hands and arms as a protection against poisoning and skin troubles in factories.

Two grades are marketed, No. 1 for use prior to contact with grease, oil, tar, etc., and No. 2 for protection against acid and alkaline solutions and chemicals.

A seven-pound sample tin is obtainable for 7s. (post free) from Sternol. Ltd., Royal London House, London, E.C.2.

Shaping Things to Come

FOR many years a large number of popular cars have incorporated self-aligning door hinges, and also windscreens, produced by G Beaton and Son, Ltd., of Victoria Road, Willesden. The weekly production of some 400 different types of hinge is about 60,000.

This firm, now under the direction and management of Col. L. Sadler, has developed a very efficient aircraft section.

Work at present passing through the department is almost entirely for a well-known medium bomber now entering the Service. The parts produced are elevators, ailerons and rudders and complete cockpit enclosures. Ribs are built up in jigs and the whole of the riveting done in the jig. The members are anodically treated before and after assembly.

For the framework of the cockpit enclosure a very thin-gauge rectangular alloy tube is used and the bending operations are carried out beside the assembly jigs, the tube being loaded with Bendalloy during the process.

Press tools are ready for the production of parts for a single-seater fighter now due for large-scale manufacture and a few yellow chromate-treated Alclad ribs can already be noticed. These will later be treated with protective Cellon aluminium paint.

In another part of Beaton's premises an unusual and apparently most effective rolling machine has been built to the firm's own design. Considerable skill is needed in the first setting and arrangement of wheels, but once begun, most complicated forms are quickly turned out from the strip.

A PAIR OF SPECIALISTS

The 340 m.p.h. Seversky Executive and the Abrams Explorer Survey Pushe

A THREE-SEATER "executive" transport and an unorthodox pusher monoplane planned specifically for aerial survey are two of the newest aircraft types announced in America.

The first is the Seversky Executive, which may be regarded as a development of the stripped pursuit machine used by Mr. Frank W. Fuller, Junr., to win the Bendix Trophy race last year and of the so-called "flying laboratory" built for Jimmy Doolittle, of the Shell concern, for high-altitude experiments with 100-octane fuel.

It is stated that, although the Executive is no mount for the novice, it is thoroughly practical and reliable in the hands of the average experienced pilot. Miss Jacqueline Cochran (who did so much toward making Mildenhall bearable just before the MacRobertson Race) certainly seems to have had little difficulty in scooping up a few records with a military-type forebear of the Executive, but Miss Cochran has been reared on Gee Bees, special Northrops and similar projectiles.

The estimated figures for the Executive are nothing short of astounding. A machine which will do 340 m.p.h. at 18,000ft., which can climb 4,000ft. a minute, and which can fly for 3,000 miles has at once the essential qualities of a super-racer, an intercepter fighter and a long-distance record-breaker.

The engine of the Executive is a Pratt and Whitney Twin Wasp of 1,200 h.p., which output, presumably, is delivered with 100-octane fuel. The maximum speed is attained at 18,000ft., but the height at which the rate of climb is 4,000 ft./min. is not specified. A range of 3,000 miles is obtainable only when throttled down to economical consumption; the cruising range (at 310 m.p.h.) is "only" 2,790 miles.

Additional data on this outstanding machine are: Span 36ft., length 25ft. 6in., wing area 220 sq. ft., empty weight 4,250 lb., gross weight 6,753 lb., fuel capacity 450 U.S. gal., absolute ceiling 35,000ft.

Flown for the first time late in November, the Abrams Explorer survey machine was designed to give exceptional forward and downward vision, rapid climb to high altitudes, stability and endurance. It was decided, after due deliberation, to make the machine a pusher and to put the pilot in the nose, which is composed almost entirely of transparent panels. The sharp sweep-back of the leading edge increases the field of vision.

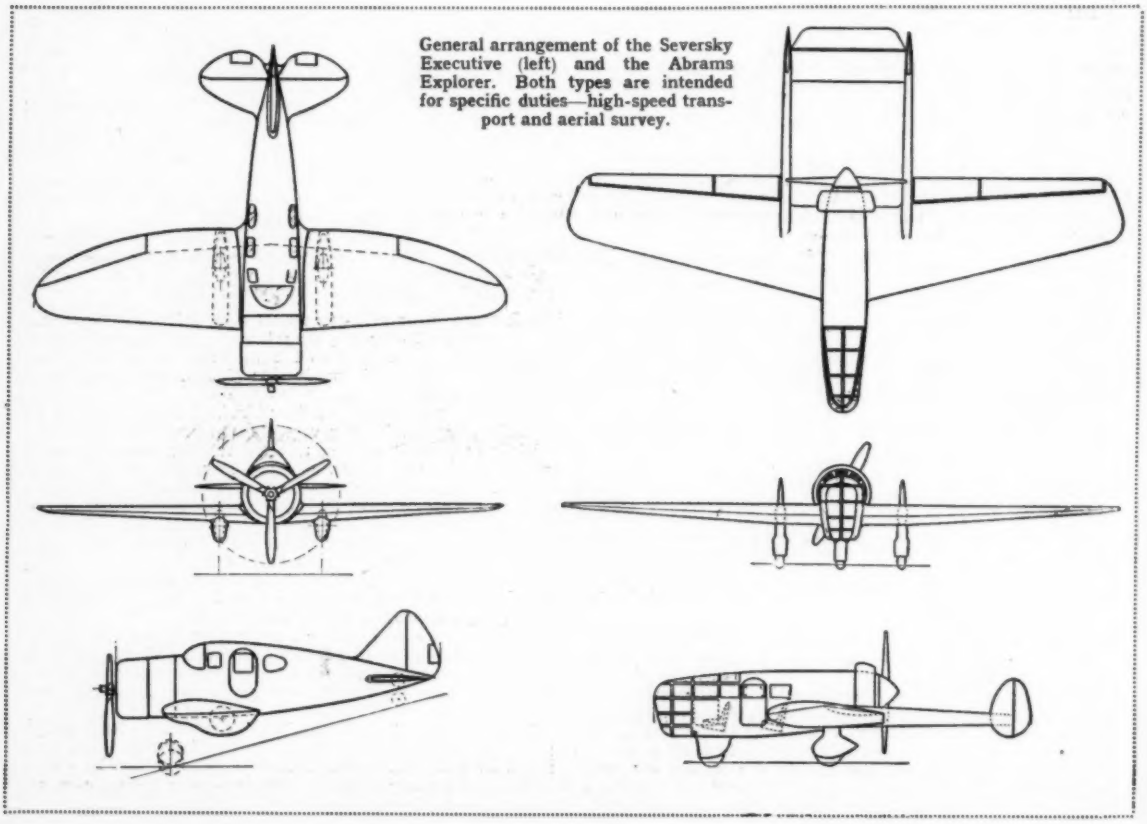
Nacelle construction employs welded steel tubes and stressed aluminium alloy skin, the cantilever wing has a single spar of steel-tube construction, and the tail booms are of duralumin monocoque construction.

A Supercharged Cabin

Provision is made for supercharging the cabin, though this must be a matter of some considerable difficulty in view of the large area of transparent covering. One door is fitted on each side of the nacelle, special arrangements being made for the photographer to take pictures at an oblique and forward angle without opening one of the outer doors. A hermetically sealed porthole for mapping is built into the floor.

The prototype machine is fitted with a Wright Whirlwind J-6-9 E radial of 330 h.p. driving an adjustable-pitch propeller (not variable in flight), but provision has been made for the installation of units of up to 450 h.p. Subsequent designs will be planned for higher powers.

Data relating to the Explorer are: Wing area 191 sq. ft., weight empty 2,100 lb., gross weight 3,400 lb., top speed (sea level) 185 m.p.h., landing speed 60 m.p.h., service ceiling 19,000ft., cruising range 1,200 miles.



General arrangement of the Seversky Executive (left) and the Abrams Explorer. Both types are intended for specific duties—high-speed transport and aerial survey.

The TREND of INVENTION

Recent Aeronautical Patents Reviewed

Undercarriage Position Indicators

THE importance of the pilot being aware of the position of his retractable undercarriage, particularly when he is about to land, is such as to justify a special instrument being installed in the cockpit to give this information. Two patents have recently been published covering instruments of this type, which are to-day in extensive use.

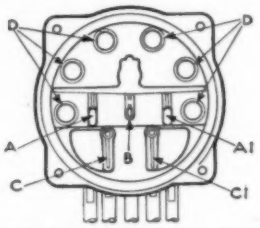
The first of these, in the name of G. H. Dowty, is shown in the accompanying illustration and is designed to show the position of the undercarriage, the flaps and the tail wheel, the main feature being that the indication is made by the movement of a member which resembles in appearance the part whose movement it indicates.

The undercarriage retraction is indicated by the movement of the members A and A1, the tail wheel by B and the flaps by C and C1.

These parts are caused to slide or pivot by positive connections, such as Bowden wires, which connect them with the parts whose movements they indicate.

Incorporated in the indicator is an audible warning device which emits a note when the throttle is closed if the undercarriage is in the retracted position.

There are also six electric lamps D, two of which show when each side of the undercarriage is down and locked, two when it is up and locked, while the remaining two show when the tail wheel is down or up.



The latest Dowty undercarriage and flap indicator, described above.

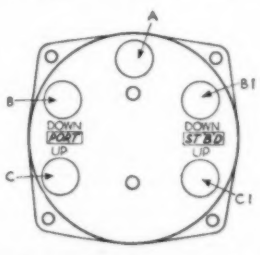
The second patent, which is in the name of Automotive Products Company, Ltd., and Gambrell Bros. and Company, Ltd., shows an indicator of a similar nature, but which works on a different principle. This indicator is concerned only with the port and starboard undercarriage gear. There is an audible warning device incorporated and five electric lamps (see illustration), A being red, B and B1 amber and C and C1 green, while in addition there is a manually operated switch.

The novel feature of this instrument is an automatic electrical switch which is controlled by the air speed of the machine and which confers definite advantages in the operation of the indicating device, and which will be evident when the working of the system is appreciated.

When the manual switch is on, and both undercarriage units are in the landing position, the lamps C and C1 will be alight. When both undercarriage units are in the retracted position the amber lamps B and B1 and the red lamp A will be alight. The red lamp will also show if either of the undercarriage units is not in the landing position. A further feature is that when either of the undercarriage units is not in a suitable position for landing and when the speed of the aircraft falls below a given figure, say 90 m.p.h., a bell will ring and will continue to ring until a lower speed of, say, 30 m.p.h., is reached, after which it will cease.

The ringing of the bell and the lighting up of the red lamp under the same conditions as described above will also take place when the manually operated switch is in the "off" position.

In this way adequate warning is given when required, but the indicator does not continue to function at times when the necessity does not arise. The detailed connections and apparatus used in this construction are given in the specification.—*Patent No. 469032 (G. H. Dowty) and Patent No. 474602 (Automotive Products Company, Ltd., and Gambrell Bros. and Co., Ltd., and Others).*



Another undercarriage indicator described in this column; it is a patent by the Automotive Products Co., Ltd

Fluid Coupling Brake

IT is proposed to use a fluid coupling—for example, of the Fottinger type—as a braking device. The coupling has one member integral with the body of the aircraft wheel and the other member is capable of being fixed to the axle by dog clutches. The coupling gives a braking effect which decreases as the aircraft slows down, and which might be brought into action by engaging the dogs before the aircraft lands, as the braking effect will not begin as soon as the wheel begins to turn, owing to the need for the fluid in the coupling to become properly distributed before any retarding effect occurs.

An auxiliary friction brake may be used for finally stopping the aircraft.

The brake requires no attention from the pilot at the moment of landing, and the risk of skidding or nosing-over is, it is claimed, considerably reduced.—*Patent No. 471117: Propello Inventions, Ltd.*

Windscreens

WINDSCREENS of the type which can be fixed in a more or less vertical position, thus leaving the cockpit open, or which can be placed horizontally to form a transparent roof, completely closing the cockpit, are already known.

The chief improvement in the type described, as compared with earlier arrangements, is that it is proposed to use a one-piece screen which can be tilted to leave the cockpit entirely open, whereas some earlier arrangements had a fixed and movable part, the latter telescoping over the first so that only a part of the cockpit was opened.

In the present arrangement the one-piece screen is curved both transversely and longitudinally, and is pivoted at both sides to the sides of the cockpit. When tilted forward the front end drops down inside the cockpit and the rear end forms an upright screen, and when tilted back it entirely covers the cockpit, fitting against a streamline fairing at the rear.

The screen is balanced against air pressure when open by a spring connected to a cable running over a cam face on the screen.—*Patent No. 465733: Vickers (Aviation), Ltd., and B. N. Wallis.*

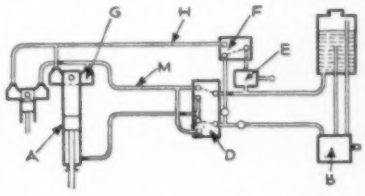
Hydraulic Stand-by Device

FOR the operation of various units on an aircraft and, in particular, retractable undercarriages, liquid pressure is commonly used, and is conveyed to and from the operating jack by means of two pipelines.

It is quite possible, particularly on military aircraft, that the pipeline through which pressure is normally transmitted to lower the undercarriage may be damaged, rendering lowering of the undercarriage impossible. The invention provides an alternative pipeline which may be brought into use if the normal line is damaged, the change-over being effected by the operation of a single valve.

To lower the undercarriage the jack A (see illustration) is normally fed from the mechanical pump B through a selector valve D and pipeline M. Should the pipeline M be damaged, the pilot can manipulate valve F to connect the auxiliary pipeline H to a hand pump E, by which the pressure for lowering the undercarriage may be generated.

There is an automatic valve G at the head of the jack, and this is controlled by the pressure in either pipeline M or G to close the line not in use. This valve is fully described in the specification.—*Patent No. 469906: Automotive Products Company, Ltd., and Others.*



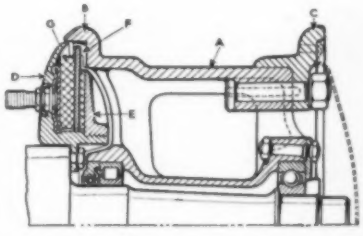
An emergency hydraulic system by Automotive Products, described above.

Wheel and Brake

THIS patent deals with an aircraft wheel in which the brake, which is of the disc type, is arranged in a casing which is housed within the streamline contour of the wheel, and the outer surface of which curves to form a continuous streamline profile.

The hub A (see illustration) is mounted on ball and roller bearings on to the axle, and is of hollow box construction with two flanges B and C for retaining the tyre in position. The inner one of these flanges B has an extended lip which overhangs a collar D fixed to the axle. A second collar E is also attached to the axle, and to this a non-metallic friction surface is riveted.

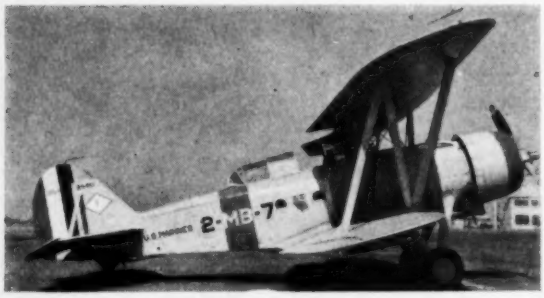
A second non-metallic friction surface G is also inserted in the casing formed by the collars D and E, and this has radial extending pieces by which it engages with D. Between these two friction surfaces is a metallic disc which engages with the lower portion of the flange B. An expansible bag, into which compressed air, or liquid under pressure, is admitted, brings these friction surfaces together and so produces the braking torque. It will be noted that the brake assembly is mounted in a casing which is within the streamline profile of the wheel.—*Patent No. 466975: Dunlop Rubber Co., Ltd., and Others.*



A disc-type brake patented by the Dunlop Company.

AMERICA CLEANS UP

Two Monoplanes and a Biplane with Some Interesting Features



At the top is a striking view of the Curtiss P-36 single-seater ordered in quantity for the U.S. Army Air Corps. It is a clean design to the modern formula, but the undercarriage, which twists when retracting (as on the Miles Kestrel Trainer), gives rise to two excrescences. Below the Curtiss are two Great Lakes dive bombers. It will be seen that the original version, on the left, has been developed into an exceptionally clean biplane (right) with a retractable undercarriage and a performance much superior with the same engine. At the bottom is a Curtiss A-18 twin-Cyclone attack machine, a shapely two-seater which carries a big armament load.

SOME RECENT BOOKS

Gipsy Major Aero Engine. Price 3s. Published by H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2.

WITH the characteristic detail and thoroughness of all Air Ministry handbooks, this volume offers complete information about the De Havilland Gipsy Major I and II engines, also details of procedure for servicing and inspection. Large numbers of photographs and diagrams support the descriptions

Jane's All the World's Aircraft, 1937, Compiled and Edited by C. G Grey and Leonard Bridgman; 2 guineas, Sampson Low, Southwark Street, London.

THIS newest edition of a monumental work stands out among the aeronautical publications of the year like some all-seeing, all-knowing colossus. Since 1911 those responsible for the compilation of *Jane's* have striven to compress their information on the aerial equipment and operations of all nations into a tome of practical dimensions, and the modern version of the work offers its wealth of facts and data in a most convenient form. Sub-divisions are: Development during 1936 of civil aviation in every country; descriptions of the flying services of all nations; modern aircraft of all nations, illustrated by photographs and G.A. drawings with specifications; aero engines of all nations; and, finally, airships of the world. There are errors, but their detection will defy all but the most exacting technician. To say that the publication is as good as ever if not better, is praise enough.

The Story of the Zeppelins

"Zeppelin," by Capt. Ernst A. Lehmann. 15s., Longmans, Green and Co., Ltd.

IN his introduction to this book, written after Capt. Lehmann's death, Cdr. Charles E. Rosendahl writes: "As he left the scene of the blazing *Hindenburg*, practically dragged away for medical assistance, fatally burned and sick at heart, his entirely clear mind running rapidly over his profound and basic airship knowledge . . Lehmann could only repeat 'I don't understand it, I don't understand it.'"

The attitude of mind which prompted that remark, the great faith in the venture to which Lehmann had devoted his

THE FOUR WINDS

ITEMS OF INTEREST FROM ALL QUARTERS

REARMAMENT: Changing the barrel of a Browning machine gun in a Boeing single-seater pursuit monoplane of the U.S. Army Air Corps. A portion of an ammunition belt may be seen draped over the side of the cockpit. Browning guns, in adapted form, are standard equipment in our own Royal Air Force.

THE Douglas company hopes to have the D.C.4 prototype finished this month. This machine has four Twin Hornet engines, a tricycle landing gear and triple fins.

A Fairchild 24 light cabin monoplane with a Ranger inverted engine has been sold to the Oerlikon Machine Tool Works at Zurich. A dummy "cannon" is fitted for demonstration purposes.

Mlle. Maryse Hilz, the French airwoman who was missing for nearly three days, was found last week in the desert on the Gulf of Oman, Iran. She had been forced down by storms and engine trouble.

The R.Ae.C. informs those whom it may concern that the disused landing-ground at Penshurst, Kent, has been acquired by the Eridge Polo Club; extensive returfing is taking place, and pilots are particularly asked not to land there.

The Cold Weather Equipment Test Group of the American Army Air Corps has been experimenting with steel cleats embedded in the tread of low-pressure aeroplane tyres with the object of obtaining a better grip on ice-coated runways.

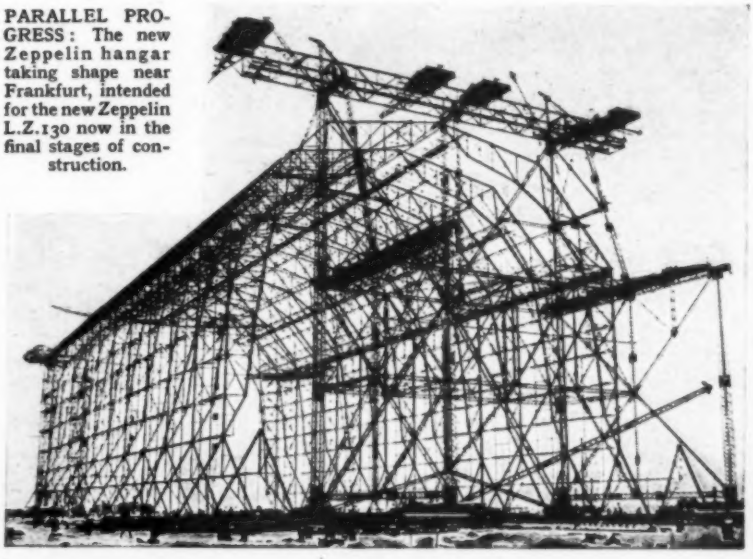
Mr. R. H. Henderson, a banner-towing pilot, has made his second forced landing in London within a week. Following the incident at Crystal Palace, where he landed in the grounds, he was obliged to put down his Avro 504 in Kew Gardens, striking a tree in the attempt. He was uninjured.

The crews and ground staffs for the new German Zeppelins will be accommodated in a town of their own near the Rhine-Main airport at Frankfurt-on-Main. By next year there will be room for 5,000 people. Captain Hans Schiller has been elected the first Mayor. Meanwhile the framework of the great hangar for the L.Z.130 is nearly ready for covering.

The West Surrey Joint Town Planning Committee has received a report from the Air Ministry stating that the site of their proposed aerodrome at Peasmarsh, near Guildford, was too small to comply with standard aerodrome requirements.

Mr. W. A. Kerr claims to have set up an Empire record for parachuting by jumping from a Rapide at 22,393ft. When he left the machine the temperature was 22 degrees below freezing point and he felt weak and ill. During the descent he became unconscious and had not "come to" by the time he reached the ground. The jump, made in South Africa, exceeded Tranum's best but was well short of the world's record —32,000ft.—to the credit of a Russian.

PARALLEL PROGRESS: The new Zeppelin hangar taking shape near Frankfurt, intended for the new Zeppelin L.Z.130 now in the final stages of construction.



The Saro Londons of No. 204 Squadron, which are on their way to Sydney, left Singapore for Batavia on Monday, January 10.

At Wiley Post Airport, Oklahoma City, a Mrs. Fay Cox made twenty-two parachute descents in a day for the benefit of some 10,000 spectators.

Miss Amy Johnson has bought an H 17 glider built in this country to German designs. The span is just over 30ft. and the weight 160 lb.

Germany has indicated her intention of resuming experimental transatlantic crossings, using L.Z.130, and a new permit for landing in the United States has been requested.

Certain American airlines during the winter have been supplying oxygen to assure maximum efficiency for pilots flying high "over weather." In one case it is planned to enhance the comfort of passengers by feeding oxygen into the cabin. In this instance the stewardess would have control, unknown to passengers, to avoid possible misunderstanding or psychological effect.

Twenty-five Years Ago

(From "Flight," January 11, 1913.)

"From the rustics who gathered around he [Marcel Desoutter] learned that he had descended at Cuffley. . . . Finding out from them his true direction back to the aerodrome . . . . he asked one of them to give his propeller a pull over. To Desoutter's astonishment the reply was: 'It ain't no good, guv'nor, I wouldn't lay me hands on the thing, not if you give me a 'undred quid.' And the rest of them had the same holy fear of the machine, for it was the first time they had seen an aeroplane."

KIT, or the White Man's Burden : A story without words from N[illegible] regal

Demons in Australia

IT is some years since the Royal Australian Air Force placed an order for Hawker Demons as general-purpose aircraft. Of late no little consternation has been caused by a series of crashes, actually nine in number, in which one pilot was killed and six other members of crews were injured. As a result a technical committee was appointed to enquire into the matter.

Mr. Thorby, the Minister for Defence in the Federal Cabinet, has now made a public statement on the findings of this committee. It has reported that no fault could be found with the mechanical and general efficiency of the Demons. The accidents appeared to be due almost entirely to inexperienced piloting, or to poor ground maintenance.

The character of the Demon is therefore completely cleared, as everyone in this country confidently expected that it would be.

R.A.F. Staff College

THE following officers have satisfactorily completed the fifteenth course (1937) at the R.A.F. Staff College and are entitled to the graduates' symbol "*p.s.a.*" after their names in the respective Air Force Lists:—

Royal Air Force

Sqn. Ldrs. R. L. Ragg, A.F.C., D. Macfadyen, R. B. Jordan, F. J. Fressanges, W. A. Opie, J. W. Colquhoun, H. I. Cozens, G. R. Beamish, M. D. Ommanney, C. R. Hancock, D.F.C., J. R. Addams, A.F.C., T. G. Pike, L. Dalton-Morris, F. G. Cator, W. T. Holmes, F. S. Hodder, T. N. McEvoy, F. M. V. May, A. C. H. Sharp, R. L. R. Atcherley, C. M. Heard, A. H. Montgomery, M.B.E., I. J. Fitch, J. Norwood, G. F. Macpherson.

Flt. Lts. W. F. Pharazyn, J. E. R. Sowman, W. G. S. Wood, F. C. Read.

Royal Canadian Air Force

Flt. Lts. W. D. Van Vliet and A. L. James.

Royal Australian Air Force

Sqn. Ldr. R. H. Simms, A.F.C., and Flt. Lt. V. E. Hancock.

Royal New Zealand Air Force

Sqn. Ldr. S. Wallingford.

The following officers of the Royal Navy, the Army and the Indian Army have also completed the course:—

Royal Navy

Cdrs. W. O. Scrymgeour-Wedderburn, D.S.C., *p.s.c.*, and C. A. N. Chatwin, *p.s.c.*

Army

Capt. F. C. W. Fosbery, *p.s.c.*

Indian Army

Major J. F. R. Forman, *p.s.c.*

Dhibban Station

THE Air Headquarters of the Iraq Command were to move from Hinaidi to Dhibban on January 8. No. 3 Section of No. 1 Armoured Car Company moved to Dhibban on December 13 last and the R.A.F. Hospital at Hinaidi on December 15.

Dhibban, on the Euphrates, 52 miles from Baghdad, is a fine station with central heating in the buildings and a supply of hot water for the winter, and electric fans in all rooms for the hot weather. Playing fields, tennis courts, two swimming baths, a cinema, and three churches have been constructed. Trees have been planted to give shade. The aerodrome has macadam runways. An embankment has been built to protect the aerodrome from the floods of the Euphrates river.

SERVICE A

Royal Air Force and Official Announcements fleet A

The Hawker Hurricane

THE first batch of Hawker Hurricane fighters has now been delivered to the Royal Air Force. It is expected that deliveries will now be steady and continuous.

Far East Aircraft Depot

AN Aircraft Depot of the Far East Command was to form at Seletar, Singapore, on January 3.

Air Force List

THE January issue of the *Air Force List* has now been published. It can be purchased (price 4s.) from H.M. Stationery Office at the following addresses: Adastral House, Kingsway, London, W.C.2; 120, George Street, Edinburgh; 2, York Street, Manchester; 1, St. Andrew's Crescent, Cardiff; 15, Donegall Square, Belfast; or through any bookseller.

Perseus Performance

TO date no power figures for a fully supercharged Bristol Perseus sleeve-valve engine have been issued in this country but some data supplied by Fokker on the G.1 twin-engined fighter-attack monoplane as powered with two such units gives an indication of what may be expected from this type of small-diameter single-row radial. The following figures permit a comparison with the results obtained from the current fully supercharged poppet-valve Mercury of similar diameter and capacity. The data is, of course, estimated, as the only power unit so far specified for the G.1 is the small-diameter two-row Hispano 14-AB 02, giving 750 h.p. at 11,500 ft. These figures are of special interest because the Perseus engine, in medium supercharged form, is already in service with the R.A.F. in Vildebeest IV torpedo bombers. The Blackburn Skua dive-bomber fleet fighter is likely to have a fully blown Perseus, and the later editions of the Lysander will mount a medium supercharged version.

	Bristol Mercury VIII.	Bristol Perseus (fully supercharged).
Top speed	at 16,070ft.	at 14,760ft.
	288.7 m.p.h.	301 m.p.h.
Cruising speed	at 16,070ft.	at 14,760ft.
	223.5 m.p.h.	229.7 m.p.h.
Climb to 3,280ft.	1.6 min.	1.5 min.
Climb to 6,560ft.	3.15 min.	2.95 min.
Climb to 9,840ft.	4.65 min.	4.35 min.
Climb to 13,120ft.	6.1 min.	5.8 min.
Climb to 16,400ft.	7.6 min.	7.2 min.
Climb to 19,680ft.	9.5 min.	8.9 min.
Climb to 22,960ft.	12 min.	11.1 min.
Climb to 26,240ft.	16 min.	14.3 min.
Service ceiling	30,500ft.	31,160ft.
Absolute ceiling...	31,500ft.	32,145ft.
Absolute ceiling on one engine	17,710ft.	18,040ft.
Range with full tanks	930 miles.	995 miles.

regalia shown, including parachute, is said to weigh 58½ lb.

AVIATION

Fleet Air Arm News : Military Aviation Abroad

Turrets on Demons

IT will have been gathered from pictures of Demons of No. 23 (F.) Squadron appearing in the daily Press that such aircraft have been fitted with Nash and Thompson (Parnall) hydraulically operated gun turrets. These devices are intended to facilitate the use of the Lewis gun and should considerably augment the potentialities of the Demon for aerial combat.

It may be recalled that a representative of *Flight* was privileged last year to fly at Martlesham in a Demon fitted experimentally with one of these turrets. He wrote: "It is the most human gadget imaginable; one has only to think of the direction in which one wishes to aim the gun and the indescribable mechanism seems to do the rest."

Reunion Dinners

A REUNION dinner for officers of the Electrical and Wireless School (No. 7 "T," Farnborough and Flowerdown), will be held at the R.A.F. Club, 128, Piccadilly, London, on Saturday, January 22, 7 p.m. for 7.30. Those interested are asked to write to Flt. Lt. F. S. Wainscot, E. and W. School, Cranwell, Lincs.

A twenty-first anniversary reunion dinner for past and present officers of No. 84 (Bomber) Squadron will be held on Friday, January 14, at the R.A.F. Club, 128, Piccadilly, W.1, at 7.30 p.m. for 8 p.m. The price of tickets is 11s. 6d. each (exclusive of wines). Evening dress with decorations will be worn. Those officers desirous of attending should communicate with either Wing Cdr. F. J. Fogarty, D.F.C., A.F.C., or Mr. C. L. Stubbs, at the R.A.F. Club.

Royal Air Force Gazette

Royal Air Force

General Duties Branch

F/O. S. T. Misselbrook is promoted to the rank of Flight Lieutenant (October 24, 1937).

Royal Air Force Reserve

General Duties Branch

The following Flight Lieutenants are transferred from class A to class C on the dates stated:—J. H. Barringer (May 22, 1937; A. T. Orchard (December 28, 1937).

Royal Air Force Appointments

General Duties Branch

Wing Commanders.—H. W. G. J. Penderel, M.C., A.F.C., to School of Naval Co-operation, Ford; to command, 1.12.37. W. K. Mercer, to R.A.F. Station, Kenley; to command, 6.12.37. G. S. Oddie, D.F.C., A.F.C., to R.A.F. Station, Turnhouse; to command, 6.12.37. G. E. Wilson, to Headquarters, No. 12 (F.) Group, Hucknall; for Air Staff duties, 1.12.37.

Squadron Leaders.—V. H. Clift, to Headquarters, Coastal Command, Lee-on-the-Solent; for Air Staff (Intelligence) duties, 6.12.37. J. Norwood, to Headquarters, Fighter Command, Stanmore; for Air Staff (Intelligence) duties, 18.12.37. C. M. Heard, to Headquarters, No. 25 (Armament) Group, Eastchurch; for Air Staff (Armament) duties, 18.12.37. F. J. Fressanges, to Directorate of Training, Air Ministry, 18.12.37.

Flight Lieutenant.—W. F. Pharazyn, to No. 72 (F.) Squadron, Church Fenton, 18.12.37.

Medical Branch

Flight Lieutenants.—H. E. Bellringer, to No. 203 (G.R.) Squadron, Basrah, Iraq, 25.11.37. T. J. M. Gregg, to R.A.F. Station, Heliopolis, Egypt, 19.11.37. S. R. C. Nelson, to No. 45 (B.) Squadron, Helwan, Egypt, 14.11.37.

Chaplains Branch

Revd. R. N. Shapley, M.C., to Headquarters, R.A.F., Palestine and Transjordan, Jerusalem, 22.11.37. Revd. W. E. Woosnam-Jones, to R.A.F. Station, Cranwell, 16.11.37.

FOREIGN SERVICE NEWS

Gas

ACCORDING to a Dutch authority a gas bomb, on account of its relatively thin casing, will carry up to 50 per cent. of its total weight in the form of chemicals, whereas a typical gas shell contains only 8 per cent. The shell, moreover, wastes most of its contents impregnating the ground, calculations indicating that only 5 per cent. of the charge will pollute the air some distance away.

A Yperite (mustard gas) bomb weighing 4.6 kg. will infect a surface of about 160 sq. m. Even so, it is stated, it will take nine aircraft, dropping sixteen bombs apiece at intervals of 25 m., to infect a surface 200 × 350 sq. m., the contamination being 6 gm. of chemical per square metre.

In the opinion of the authority who presents these figures, raiders attacking a town would rely mainly on incendiary bombs to start fires, hampering the fire-fighting arrangements with delay-action bombs. A certain amount of gas would be used for moral effect.

The Position in Paraguay

SEVERAL important political developments in Paraguay have, to a certain extent, upset plans for the development of civil and military aviation. The Paraguayan Air Force is still waiting for machines from Italy, but a number of pilots and mechanics have come to Europe to receive instruction in the handling and maintenance of modern aircraft and to take delivery of a number of Caproni bomber-reconnaissance machines. Certain of the pilots will visit England to look into the possibilities of a number of our types for Paraguayan service. A correspondent writes that several other types are badly needed, including trainers, light transports and, to a lesser extent, fighters, including single-seaters.

At the moment, the Paraguayan Air Force is practically without flying equipment, no machines having been bought since the beginning of the Gran Chaco war. The few machines left are out of date and in bad condition.

TRAINING AN AIR FORCE PILOT

Controversial Subject of Bad-weather Service Flying Raised at R.U.S.I. Lecture

THE much discussed question of training R.A.F. pilots in flying through bad weather was raised during a discussion at the Royal United Service Institution on Wednesday of last week.

It is a matter which has caused serious misgivings in many quarters, and the replies of the lecturer, Air Vice-Marshal L. A. Pattinson, and of the chairman, Air Marshal W. G. S. Mitchell, were not completely reassuring. The former pointed out that, from the viewpoint of training, flying by instruments under a hood is a substitute for flying through bad weather, while the latter admitted that civil commercial pilots were on the whole better at bad-weather flying than R.A.F. pilots because the former were more experienced. There was also slow delivery of certain instruments. Both anticipated an improvement in the future.

The occasion was a lecture on the training of an Air Force pilot, a subject with which many readers of *Flight* are well acquainted, but which was evidently novel to officers of the Navy and Army. A.V.-M. Pattinson, who commands No. 23 (Training) Group, described the main differences between the training system before the expansion and the new system which began towards the end of 1935. He confined himself to the cases of university entrants, short-service officers, and airman pilots, all of whom pass through R.A.F. flying training schools. Under the old system they all spent twelve months at a F.T.S., but had to receive further training on joining their squadrons.

The Two Systems

The reasons for introducing a new system were two: (1) To let the squadrons concentrate on squadron work, and (2) to meet the demand for a greater output of pilots. He described how civil schools were instituted, at which basic flying training and ground instruction were given. The discipline at these schools had to be strict, but life was on a civilian basis and the pupils did not wear uniform. These schools also gave elementary instruction in instrument flying and simple cross-country work. Pupils spent eight weeks in summer and ten weeks in winter at these schools.

Then the pupils went to the depot at Uxbridge for a fortnight, where they were taught drill and service discipline, and they got their uniform while there.

The next stage was at a flying training school where the pupils first went through the intermediate course. In this course, which lasted for thirteen weeks in summer and fifteen in winter, they learnt to fly Service-type aircraft, did advanced instrument flying (including navigation under the hood), and fairly long cross-country flights. They also had advanced ground instruction and had to pass examinations. At the end of this course they ought to be able to fly automatically, and to treat flying as a means to an end, and not as an end in itself. On completing this course the pilots received their "wings."

After the vacation they returned to the F.T.S. for an advanced course, again of thirteen weeks in summer and fifteen in winter. This was a course in applied flying, i.e., in R.A.F. air work, including live bombing and air gunnery at an armament training camp.

In all the new training course took ten months as against twelve under the old system. Yet whereas formerly a pilot used to average 50 hours' solo on Service types, he now averaged 70 hours. One of the great changes, however, was that the number of flying hours was no longer the criterion; pilots were now judged by the number of exercises they had carried out and their proficiency at each.

During the last stage, in the advanced training squadron at the F.T.S., pilots were paired, with the exception of those destined for single-seater fighters, and the same two usually flew together, taking turns to be pilot and observer. This was considered very useful training.

As regards specialisation, the schools would like to train all pilots in the same way, but the operating commands wished for specialisation. A compromise had been made, and when joining a flying training school the pilots were divided into three groups: (1) Heavy bombers, (2) light bombers, medium bombers, torpedo bombers, and army co-operation, and (3) fighters. Twin-engined training machines had lately been introduced into the F.T. schools. Pilots destined for general reconnaissance, army co-operation and other specialist branches did further courses after leaving their F.T.S. In reply to a question, the lecturer said that Fleet Air Arm pilots were trained at Leuchars, where there was a catapult and a dummy deck. Some of them also did a course on floatplanes on the south coast.

Despite insistence on economic use of flying time, the lecturer admitted that there was considerable pressure at the F.T. schools, and, though they had met all demands, it was hoped that the pressure would relax when expansion was complete.

THE R.Ae.S. RECEPTION

SOME very interesting and instructive films will form part of the attractions offered at the Royal Aeronautical Society's annual reception, which is to be held in the Aeronautical Section of the Science Museum, South Kensington, next Wednesday, January 19.

Those interested in the tricycle undercarriage (and who is not?) will certainly take the opportunity to witness the film of one of the new American light aeroplanes so fitted "doing its stuff." Helicopters and gyroplanes (including paddle planes) will figure in the programme, and the audiences will be able to see how the "Roadable Autogiro" behaves aloft and alow. It does not, as one wag thought, taxi up to the traffic lights and jump over them if they show red, but it is almost as good a motor car as it is aircraft.

In this country we have not done much with steam-driven aeroplanes since Maxim's day, and the film showing the take-off and flight of the American Bessler steam aeroplane is sure to attract attention.

In addition to the films there will be television demonstrations (not, one fears, from aircraft), so that apart from the reception and the pleasure of meeting people, there will be plenty to interest.

It might be pointed out that non-members of the R.Ae.S. may attend the reception, which begins at 8.30, and that the price of tickets, obtainable from the secretary of the R.Ae.S., 7, Albemarle Street, London, W.1, is 5s. each, inclusive of buffet. The occasion is a formal one, and evening dress and decorations will be worn.

COMMERCIAL AVIATION

WHAT AUSTRALIA BUYS: The first Douglas D.C.3 to be put into Australian service flying over the city of Melbourne. The machine is named *Kurana* and is used by Airlines of Australia on the Brisbane-Sydney service.

THE WEEK AT CROYDON

Just Weather : Wildfowling : Obstructioneering : Propping It Up : Dramatic Interlude

IT was bad luck that the Duke and Duchess of Kent had to cancel their air trip to Paris by Imperial Airways on Tuesday of last week, owing to fog and bad weather generally. The Paris route was especially affected, for an Air France machine turned back to Paris that day after reaching the English coast; an incoming Imperial had to land at Shoreham; while British Airways landed one of their inward machines at Heston. Neither was it too good on Wednesday, when I travelled on one of the more northerly routes. Getting up above the clouds, after a "white line" take-off, was a bumpy business, and so was the descent at the other end. Over the clouds, however, travel was as perfectly smooth as it should be, and the surface of my coffee hardly quivered in its cup. In earlier times liquid refreshment had a disconcerting habit of remaining temporarily in mid-air under one's nose, whilst a hearty downward bump removed the cup suddenly from under it. Schemes for serving soup in a sponge and beer in the form of small frozen tablets were, I believe, never brought into actual practice.

Fowl Play

The fowls of the air are causing quite a lot of annoyance here. First it was pigeons, one of whom staged a sit-down strike under the wheel of a taxying machine, and now it is gulls, which collect in large numbers in stormy weather and adopt a truculent "get out of my way, drat you" attitude towards their mechanical cousins. Some companies have complained to the authorities, but what is the remedy? You can go gunning for the resident birds (though the local partridges are no nuisance, having developed special habits, and are even reputed to nest underground), but gulls come up from the sea, and if you bumped off conducted tour number one, another lot, led by an elderly puffin, would arrive as soon as there was a dirty day at sea. Pilots are alive to the possibility of an uninvited gull entering the cockpit at high speed through a closed window, but they prefer that risk to the prospect of traffic hands going gunning for gulls and probably shooting up *Scylla*. There are, of course, various traps, springs, snares and gins, but Works and Bricks would be for ever getting caught in them, so on the whole we prefer the gulls.

Another not so funny hazard for pilots has just been erected on the summit of the hill to the south of the aerodrome, where there is a school with a tallish tower which has been there ever since the airport existed, and, therefore, does not form a serious obstacle, for everybody knows all about it. Now, a quite incredible mass of steel girders has been built on higher ground than the school spire, and 150 yards nearer the airport. It is already 150ft. high and humorists aver that the Air Ministry official who ordered its erection has gone on leave without saying when to stop, so that day by day it grows higher and more menacing. The idea is a wondrous one, for this super-pylon is designed to warn pilots of the spire which they know all about. We are nothing if not conservative, for the warning, temporarily, at least, is to be conveyed by means of the odd smouldering hurricane lamp with the usual smoke-blackened glass.

But why, you will say, did not Imperial Airways, British Airways and all the foreign companies protest against the whole proceedings in advance, thus saving a great waste of time and money and the erection of a new obstruction? The answer is that no practical expert, no man who flies in and out every day in all weathers, and no responsible official of an air transport company was consulted in advance—which is a way they have in the Civil Service. Once before they did a similar thing, and, in spite of warnings in *Flight*, stuck to it that they were right. A great many people, especially Air France, have not forgotten and will never forget what happened about that other unsuitably placed pylon. The humorous part of this affair is that they say the steeple is too fragile to take the light (in which case it seems likely that one of our careless airport gulls will knock it down one of these days) and, further, if a light were erected on it and it went phut, a steeplejack would be required to put the matter right. Presumably, therefore, if a roof-tile slips its moorings the same nimble acrobat's services have to be sought. I also hear that the school people would not have the pylon any nearer. Having had a look at it, I don't wonder.

Sensory Appeal

The scaffolding experts around the main building are dour, persevering blokes. Having seen what I wrote last week, I presume, they have now draped a singularly revolting brand of sacking over the superstructure, thus obscuring any ray of light from many offices. Moreover, they are lavish with some offensive fluid closely resembling cold tea and made with slime from some primordial swamp, so, what with the weather and all, we are about as happy as a supersensitive perfumier would be on a sewage farm.

One Victor Ricketts, whose knowledge of aviation is perpetually at war with the incredibly dramatic instincts of the public print he represents, is to fly with F/O. Clouston to Australia on February 1. He is to take a typewriter on which, I am sure, the "d," the "r," the "a," the "m" and the spare "a" are all worn down to the quick, and they say he has recently bought a rabbit rifle from an esteemed contemporary. He will also need a kangaroo gun and a wallaby exterminator, to say nothing

of ear-plugs against laughing jackasses. One wishes him well, and may nothing he writes turn and rend him, boomerang fashion.

Commercial aviation is essentially international. You just cannot get away from it. The other day I met the British representative of a Dutch air transport company, who, in a Swedish machine of American manufacture, was paying for a cup of tea in Netherlands money and getting his change from the steward in English money. The tea was a judicious blend of Indian and China. A. VIATOR.

The Congo Service

SINCE the question of a government subsidy to the company has not yet been cleared up, Sabena is to discontinue, for the time being, its service to the Belgian Congo.

Another New Type for Air France

THE question of how their new prototype, the Couzinet 10, is to be utilised, is a source of discussion within the Air France offices. The machine was first flown on August 2 of last year and went to Villacoublay for its official tests on November 26. The pilot in charge of the trials is Dubordrier, and he has registered a cruising speed, at 74 per cent. power, of 208 m p.h The machine has Hispano Suiza 9 V engines of 650 h.p. each.

New York Terminus

THE conversion of the Glenn Curtiss Airport, North Beach, Queens, N.Y., which is now taking place, is approved by a report recently sent by the New York Harbour Board, the responsible authority for airports in New York State, to the Governors of New York and New Jersey State.

The airport will be enlarged to serve as a terminus for the transatlantic services. More than 105 acres will be added by land purchase and reclamation on the quay, making a total area of 429 acres. The airport will be opened in 1939, and will serve as a landing ground for visitors to the World Fair, whose grounds it adjoins.

Further recommendations of the report are for an airship mast at the Floyd Bennett Field, and extension of the Newark Airport. The report also recommends that the New Jersey Senate shall retain sufficient land in the plain of the Passaic River for any later developments.

The Night Mail Accident

THE opinion held by the majority of the pilots at Croydon in the matter of the accident to the D.L.H. night freighter on the night of November 26 was largely substantiated during the inquest, which was held on January 6. It would seem, reading between the lines, that the machine accidentally started its take-off from a point which did not actually provide the maximum possible run, and that the pilot was possibly turning on to course, thinking that he had several hundred yards of clear aerodrome in front of him, when the machine struck the hangar.

Capt. Pelly, who took off in a similar machine soon afterwards, said that the visibility was so bad that it was not possible to follow the white line and that he chose to start his run from the tarmac end so that he would know exactly where he was. He added that some time previously one of the freight machines had, in similar circumstances, been "lost" on the aerodrome. The difficulty involved in taxying to the desired point on a fog-bound aerodrome with an irregular boundary may well be imagined, and our sympathy is extended to D.L.H., whose pilots have flown the night mail with such astounding regularity during the past years.

Reducing Radio Congestion

NOW that the amount of air traffic is so seriously congesting the available radio wavebands, it is only natural that attempts should be made to introduce equipment which will help to make every machine a self-contained unit so far as normal radio navigation is concerned. Not long ago a medium-wave "four-spoke" beacon at Croydon was transmitting experimentally, and now a permanent omni-directional beacon at Mitcham is in operation. Its purpose is to provide D/F and homing facilities for machines up to and after the moment at which they are ready to enter the Croydon controlled zone.

This beacon is designed to be used in conjunction with a similar one operating on the same frequency at Schiphol, Amsterdam, the periods of transmission of which immediately precede those of the Mitcham beacon. The frequency is 266 kc/s (1,128 metres), and the transmission continues for one minute in every three, the signal consisting of a succession of broken call signs (GED) with a dash of 42 seconds' duration to facilitate D/F and homing work.

The beacon has now been in action for some little time, and so far only one very polite transport pilot, who did not want to worry Croydon's control with unnecessary QDMs, has attempted to make his final approach at Mitcham.

Substratospheric Transport

A T.W.A. pilot who has probably spent more time in the substratosphere than any other living man—Capt. D. W. Tomlinson—speaking at the annual meeting of the American Association for the Advancement of Science, said that the company's research had shown that the speed of a properly equipped machine would increase 36.4 per cent. at 30,000 feet over its speed at sea-level. "Regular transport operation at 30,000- to 35,000-foot levels," he said, "will be with us within the next five years."

"Our objectives in these high altitude flying studies," he continued, "were four: First to choose the best method of supercharging engines; second, to determine the actual increase of speed with altitude; third, to make actual measurements of speed at 30,000 feet; and fourth, to make extended 'overweather' flights to determine actual meteorological conditions at the base of the stratosphere. . . During one flight, made on December 17, 1936, when we calculated our air speed would be 225 m.p.h., we actually travelled at a ground speed of 384 m.p.h. with a following wind."

Capt. Tomlinson suggested that the U.S. Government should carry out regular weather observation flights. He said that there were about fifty Government machines now in service which would be suitable for this work. "A large number of meteorograph stations," he said, "should also be established to augment the data obtained from aircraft observations, and to extend our knowledge of conditions in the stratosphere to, say, 50,000 feet. Forecasting at these altitudes will also be aided through development of the radio-meteorograph and by double theodolite balloon soundings." His talk was followed by an address by the T.W.A. chief meteorologist, Mr. E. J. Minser, who is one of the authorities on the Norwegian "air mass" method of weather forecasting. This method is now adopted by the U.S. Weather Bureau.

International Good Fellowship

SOME idea of the way in which the Skål Club of London has grown since the idea was first introduced over here some three years ago could be gathered from the very satisfactorily large number of members and guests present at the Club's second annual dinner and dance held last week. Mr R. W. Waugh, the agents' manager for Imperial Airways and chairman of the Club, took his rightful place, and Mr. Hans Ostelius, London manager of A.B. Aerotransport, acted as an efficient, amusing and stentorian toastmaster. This arrangement was a just and fair one, since to Mr Ostelius must go the credit for introducing the idea to London with the help of Mr. Waugh, whose wide connections made this development possible.

The toast of the Club was proposed by Mr. G. C. Rhodes, general manager in the U.K. for the French Line, who spoke largely about the Club's future, while it was left to Mr. Waugh, in his reply, to explain some of the points in the Club's development and to continue in one breath to propose, in his turn, the health of the visitors. To this toast Mr. L. Schoevaerts, president of the Skål Club of Brussels, suitably replied.

It was felt that the evening would be incomplete without a few words from Mr. Tom Potter, manager of the Travellers' Insurance Association and editor of that popular publication, *Travel Topics*, and, after explaining the more erudite details of the menu, Mr. Ostelius duly called on him. Following the announcement of a long list of prizes for luckier guests, all of which were in the form of free passages to various parts of Europe, Mr. Potter not unnaturally took the opportunity of suggesting that something might be done to encourage people to travel in the reverse direction—in other words, to visit this country. Thereafter the company adjourned while the floor at the Trocadero was cleared for dancing.

For those to whom the Skål Club is something new, it should be explained that it was started, as its name might imply, in Sweden by Capt. Carl Fiorman, of A.B.A., and is designed to foster international good will with, indirectly, the international tourist business. The organisation is still comparatively young, and it was only last spring that the fourth annual congress was held in Paris and was backed there, among others, by the French Government. Other congresses have been held at Brussels, Lucerne and Stockholm, and the association is now firmly rooted in twenty-four European countries, quite apart from Batavia, Singapore and, shortly, Brazil. The fifth congress, it is hoped, will be held in London this spring. The membership is confined to members of the travel and transport organisations.

TRANSPORT COMPARISONS—II

Some Further Comments on the Economics of Airline Operation

THE article by Mr. R. A. E. Luard in last week's issue raised a number of interesting points for the potential purchaser of commercial aeroplanes. One reader, who is intimately connected with air transport operation, suggests that the table does one aeroplane, at least, some injustice, and says that the inclusion of the D.H. 86A with Gipsy VI Series II motors and C.P. airscrews, is hardly fair in so far as no example of this type has ever gone into commercial service. He has drawn up a table to show the figures for the D.H. 89A, Lockheed 12A, D.H. 86A (with Series I motors) and the Lockheed Electra 10A.

Machines (in order of size)	D.H.89A Rapide.	Lockheed 12A.	D.H.86A Express.	Lockheed 10A.
Engines	Gipsy VI Ser. I. (2)	P. & W. Wasp Jnr. S.B. (2)	Gipsy VI Ser. I. (4)	P. & W. Wasp Jnr. S.B. (2)
Disposable load in lbs. ...	2270	2805	4229	4320
Disposable load as per cent of all-up weight ...	41	33.4	41	43
Cruising h.p. as per cent. of max. H.P.	65	75	65	75
Cruising speed in m.p.h....	132	213	140	192
Disposable load in lbs./ cruising h.p.	8.7	4.6	8.1	7.5
Fuel consumption in gal./ ton/mile/load	.134	.161	.136	.117
No. of seats	6	6	10	10
Cap. cost pass. seat/m.p.h.	£5 10s.	£7 17s.	£6 8s.	£6 4s.
Cap. cost ton/mile load per hr. ...	£39 10s.	£36 8s.	£34 0s.	£32 4s.

"It will be noticed" he writes, "that the figures for the Electra differ considerably from those given last week, which were apparently taken for a machine fitted with radio and deicing equipment, while fuel consumption figures appear to have been taken in U.S. gallons. To further the comparison the last two lines in the table have been completed for the American types, the prices used being "fly-away factory" at £1=$5. It is realised that, from the point of view of the purchaser in the United Kingdom, these figures are valueless except to show him what he is missing, there being no manufacturer in this country with the gumption to build a modern commercial machine. But it does give a guide to the overseas buyer, and goes no little way in explaining the apparent preference of operators in the Dominions for the American product.

"Actually, the figures given for the Lockheed Electra are not the normal operating ones, as 75 per cent. power is the maximum continuous cruising figure. Working the column on a basis of 65 per cent. power (line 3) the cruising speed drops to 183 m.p.h., the next line becomes 8.3, the fuel consumption drops to 0.099, while the last two lines increase to £6 11s. and £34 respectively.

"A comparison of these figures with those of the D.H. 86A brings to light the fact that metal construction costs no more than wood and wire, and it would also appear that it pays to go fast—until it is realised that leaded fuel is required in the Lockheed, which restored the balance from the point of view of operating cost, but not from the point of view of pay-load available.

"An interesting fact, which will provide yet another problem for the commercial operator, is that of the ratio of passenger to freight-capacity. In the past, fuselage shape was such that it was possible to have one's pay-load in the form of all passengers, all freight, or an arrangement to suit the requirements of the route to be operated. With increasing speeds, this is changing. Through the inability of engines of reasonable horsepower to force an object looking like a block of flats through the air at high speed, fuselages of more limited dimensions are becoming fashionable, while pay-loads are rising. This point is well illustrated by the Lockheed 14H, a new type which is rapidly proving its worth on routes in the United States. Its figures by the Luard method follow: Line 1, disposable load 7,520 lb.; line 2, 44.2 per cent.; line 3, 69 per cent.; line 4, 222 m.p.h.; line 5, 7.1; line 6, 0.094 gal. [ton] mile; line 7, 11 seats; and lines 8 and 9, £6 12s. and £21 13s. respectively.

"A machine of this type, fully equipped with radio, etc., a crew of three and a full complement of passengers, with fuel for the trip London-Berlin against a 20 m.p.h. head wind and with 45 min. extra petrol, would have a balance of pay-load of over one ton available for freight. Further, there is a reasonable chance of stowing this quantity away, with freight space at the rate of 15 lb. per cubic foot.

"This large increase in freight capacity will probably be a feature of most future high-speed types of commercial aircraft, and is liable to prove a nightmare to operators who have not a substantial airmail or freight contract. To those who have one it will come as a blessing, for medium-sized transport operators, at present, appear to experience difficulty in keeping the mail from overflowing into what could be profitable passenger accommodation.

"Which is a sorry picture for Mr. British Aircraft Constructor, without any sign, not even in the dim distance, of a British type to compare with the Lockheed 14H. What about it?"

Inverness—Glasgow

THE long-expected service between Inverness and Glasgow will be started early in May by Highland Airways, following the installation of D/F at Inverness aerodrome. The service will be run via Perth, to connect with Stirling and Edinburgh. Incidentally, Highland Airways are also contemplating a service between Inverness and Lewis.

More Transport Training

THE Danish Transport Company has now started a blind-flying course for their new pilots. The course is designed primarily for blind-approach work on the ZZ system, though it includes besides training in "economical" flying.

The school is directed by one of the D.D.L.'s most experienced pilots, Air-Capt. E. Dämm, and a specially laid-out Fokker F12 is used.

On the Way Home

ON January 10 the Short *Centaurus* left Wellington, N.Z., for Sydney on the first leg of her return flight. She reached Sydney after a ten-hour crossing of the Tasman Sea, carrying Col. White, the Australian Minister of Customs, as a passenger.

While in New Zealand *Centaurus*, which is in charge of Capt. Burgess, visited Auckland, Wellington, Lyttelton and Dunedin.

CANADIAN TERMINUS: Sea Island Airport, Vancouver, B.C., where the trans-Canada service has its western terminus. The administration building is on the right and the new radio station is on the left. In the foreground is Canadian Airways' first Lockheed Electra used on the Vancouver-Seattle service.

Commercial Aviation

AIR-MAIL NEWS

Covers from New Far East Services : Souvenirs of Surcharge Abolition : Airline Operators Listed on a Stamp

By ALEC DAVIS

Above are (left) a Syrian stamp depicting a Potez 62 of Air France and a new Peruvian issue showing "Peru united with the world by airlines." On the right are a cover carried on the inaugural Canton to Hong Kong flight via Eurasia and one flown by K.N.I.L.M. on the first Soerabaya-Macassar mail run

FLOWN covers of topical interest and potential value have been provided recently by the inauguration of new air-mail services, several of them within the British Empire.

Imperial Airways' extension from Lagos to Accra, for example, is commemorated by a cachet applied in violet ink to the envelopes carried. It is worded, "First Flight/Regular Air Mail Service/Gold Coast-Nigeria."

In India Tatas provided a special envelope, light blue in colour with design overprinted in a darker shade of blue, for the opening of their Delhi-Bombay service on Nov. 8. On its front are printed a replica of an air-mail label, the words "First Air Mail between Delhi and Bombay," and a silhouette of a monoplane. The operator's name appears—modestly—on the back.

This particular cover also bears a first-flight cachet in red, the postmark of Delhi Civil Aerodrome, and an additional marking on the back, which reads "8 Nov. 37/3.30 p.m. Delivery/Post by Air and Save Time/Bombay G.P.O." It is stated that 3,500 letters were carried on the first flight.

Trans-Asiatic

From farther east comes an envelope printed with the words *Par Avion* and (presumably) its Chinese equivalent, and bearing a stamp that shows a Junkers monoplane over the Great Wall of China. It was flown on the first Canton to Hong Kong mail trip *via* Eurasia, inaugurating on July 2 a new bi-weekly service to connect with the Hong Kong-London line.

Mr. Francis J. Field has a cover flown by K.N.I.L.M. on the first flight from Soerabaya to Macassar. To it was applied a cachet that shows not only the machine but also a map of the route, with details of date.

More significant, though far less conspicuous, are the covers carried from England to various countries on the first day of the no-extra-charge air-mail services to them. In many cases they are unrecognisable except by date and time of postmark, but at certain destinations air-mail reception marks were applied to some, at least, of the covers—for example, Rome on October 5 used a mark with the wording "Posta Aerea—Roma Ferrovia."

Among new issues of air stamps one of the most interesting designs is used by Syria. It shows an Air France Potez 62 flying over Syrian scenes, and the detail is so carefully drawn that the registration letters, F-ANPG, can be read on the side of the fuselage. Other stamps in the same set show a three-engined low-wing monoplane at present unidentified.

Peru repeats her tribute of a few months ago in issuing another stamp to commemorate Jorge Chavez, first Peruvian to learn to fly and first airman of any nationality to fly across the Alps (he died as a result of a bad landing). His portrait appears on the 15c. stamp in a new set, submitted by Whitfield King and Co., which was issued to celebrate the holding, last September, of an Inter-American Technical Aviation Conference.

Lima's modern airport is shown on the 25c. stamp, which is probably unique in that it lists, on miniature scrolls, the air mail operators in the country: Aerovias Peruanas S.A., Faucett S.A., Linea Aerea Nacional, Condor Peruana S.A., and Panagra. The last name need hardly have been included, as it is visible on the roof of one of the hangars in the picture.

The highest value of the Peru stamps shows "Peru united with the world by airlines"; a monoplane is seen flying against a map on which are indicated the main American, Pacific, South Atlantic and (prophetically) North Atlantic routes.

Other recent air stamp issues—in which Latin America, as usual, predominates—may be summarised as follows:

Bolivia.—New issue produced by surcharging. The 5c. stamp is an old 35c., illustrating a Junkers F.13 monoplane, used in that country by Lloyd Aero Boliviano.

Venezuela.—Various overprints and surcharges, followed by a set of seventeen in new designs.

Nicaragua.—Nineteen badly printed commemoratives in three sets.

Ecuador.—Set in eagle design.

Manchukuo.—One stamp.

Rumania.—New issue in old design showing a Pan-American Clipper.

Pacific Meteorology

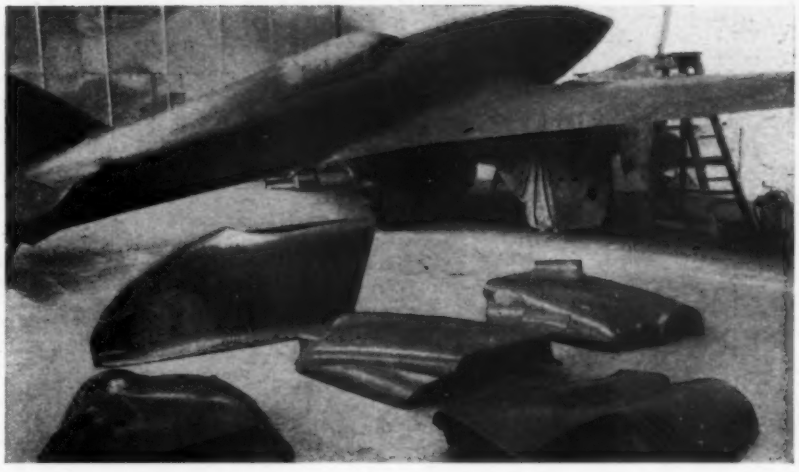
AT the meteorological conference of British, Australian, New Zealand and American experts which was held in Wellington last month definite arrangements were suggested for the establishment of a meteorological service in the South-West Pacific, to work in conjunction with the established stations in the North and South Pacific. These suggestions have been laid before the Governments concerned.

One of the proposals concerns the erection of five balloon stations, for upper-air observation, in New Zealand, Fiji, Samoa and the Society Islands. Normal observation stations would also be established in New Caledonia and the New Hebrides.

Going Ahead

AT the beginning of March Wrightways, of Croydon, will have a second D.H 86B in service for freight and special charter work of the more important kind. One or two detail changes have recently been made in the composition of this company, and Mr. L. M. Haybittel is now general manager, assisted, of course, by Mr. J. W. Duggan, the chief pilot.

In spite of the bad luck which they have recently experienced and the inevitable effect of the Paris strikes, they appear to be particularly cheerful about things in general. At the moment a Jersey Airways' 86, with Mr. Jordan as pilot, is helping on the Paris freight service while the first 86B is being repaired. Some little time ago this machine was virtually blown across the airport by a 60-m.p.h. wind after landing, and the undercarriage was damaged after it had slid sideways across the ice-bound turf on to the tarmac—where the tyres gripped again and something obviously had to go. All things considered, the damage sustained was relatively slight.



THE COMET *EN NÉGLIGÉE*: The D.H. Comet, shortly to be used by F/O. Clouston and Mr. Victor Ricketts for an attempt on the Australia record, photographed in the shops of Essex Aero Ltd., while being reconditioned before Clouston's recent Cape flight. In the foreground are some of the parts — nose fairings, engine nacelles, wing fillets and so forth —made of F. A. Hughes' Elektron AM. 503 alloy, which, it is stated, has stood up excellently to all kinds of weather in the many parts of the world traversed by the Comet on her various high-speed flights; the mechanical reliability of these sheet parts has been equally good.

THE INDUSTRY

D.H. Results

PRELIMINARY results of the De Havilland Company for the year ended September 30 indicate the large amount of work now on hand. Net profit amounted to £122,184, which compares with £71,709 for 1935-36. It is proposed to pay a dividend of 10 per cent. and a bonus of 2½ per cent. on a capital of £600,000.

Steel Properties

AIRCRAFT MATERIALS, Ltd., of Midland Road, London, N.W.1, have drawn up a card which gives a concise analysis of mechanical tests on the full range of Air Ministry steel specifications. Copies of the card will be sent on application.

Magneto History

A VERY informative brochure entitled *Twenty-five Years of Magneto Development* has been produced by The British Thomson-Houston Co., Ltd., of Coventry. Historical facts concerning aero, car and motor cycle engine magnetos are given in a readable style, and several excellent photographs illustrate the various development stages and the latest applications. A long list of records and achievements is included in the publication.

A Lord at Avros Again

WITH the exception of a break of a few years, there has always been a Lord connected with A. V. Roe and Co., Ltd. First it was the late John Lord, who shared the good and bad fortunes of the firm during all its early years. And now one of his sons, Frank Lord, has joined, or should one say re-joined, the firm. Mr. Frank Lord resigned his post at Saunders-Roe, Ltd., a few weeks ago, and has now joined Avros as assistant to Mr. R. H. Dobson, the firm's general manager.

All About Bearings

THE latest enlarged catalogue of Hoffmann ball and roller bearings has recently appeared. It is a most ambitious work which includes technical information not previously published and aiding towards correct bearing selection for given conditions.

B.S.1 data for all Hoffmann bearings are given, and there are sectioned diagrams of each type.

Interested persons may obtain the catalogue on application to the Hoffmann Manufacturing Co., Ltd., Chelmsford, Essex.

Industry in Denmark

A NEW firm, Skandinavisk Aero Industri A/S, has been formed in Copenhagen to manufacture private-owner type machines designed by Mr. Zeuthen. These include a Gipsy-engined two-seater, which is credited with a range of 685 miles and a top speed of 119 m.p.h., and is to sell at the equivalent of £760. Import permits for ten Gipsy engines have been granted by the Currency Office. Meanwhile, it appears that Mr. Jack Hedegaard who, with Mr. Bohnstedt-Petersen, a Danish subsidiary of Taylor Aircraft, is being starved out by the Danish authorities. Mr. Bohnstedt-Petersen seems to have lost his patience and chosen a new factory site at Malmö, in South Sweden.

Steel As You Like It

OUTSTANDING features which are at once noticeable during a visit to the Standard Steel Works of W. T. Flather, Ltd., at Sheffield, are the systematic arrangement and general neatness of the departments. The sequence of operations can be simply followed on such a visit, which normally commences in the main store for material supplied to the firm's specifications. One finds it hard to visualise a steel "shortage" when a single company can have so large a stock of billets, strip and bar, each batch having a neat coloured label denoting type and bearing identification numbers and letters. About 30 per cent. of the whole amount; we understood, was destined for the aircraft industry.

The main operation at the works is bright drawing and about 400 tons of steel are dealt with weekly.

To start with the strip or bar is "pickled" in hot sulphuric acid (10 per cent. solution) to remove impurities. One end of each piece is then tagged (i.e., reduced in diameter by a small amount) so that it can be passed through the die and clamped to the trolley on the draw-bench. Tagging is now usually carried out in one operation on special machines, but the old method of heating and hammering still has to be used for hard steels.

Sizes dealt with on the benches are from $\frac{7}{16}$in. to 4in., finished diameters. All the smaller draw-benches are attended by girls.

After drawing comes straightening, polishing and cutting to length. The diameter is correct to 0.001in., and even rough commercial material has limits of ± 0.002in. Material to some specifications is passed through Churchill centreless grinders and is then true to within 0.0005in.

Since the war showed the way, many jobs in such works as this have been undertaken by women, in particular the operation of the large travelling magnetic cranes, which requires great skill.

Many of the machine tools in use were built in the works; the new type tagging machines were designed, built and patented by Flathers.

In the heat-treatment department are six 15ft. furnaces with automatic control and a model plant has been laid down for producing case-hardening compound from special coke.

Large billets are dealt with separately from bars and strip, and prior to treatment, impurities are chipped out with pneumatic chisels. Billets up to 3in. square can be sheared to correct lengths on one large machine.

In the laboratory, besides research, some 300 tests per week are carried out to conform with Air Ministry regulations. Every aircraft bar must be Brinell-hardness tested and fracture tested.

Finished material is copiously labelled and very neatly stored on shelves indexed on the grid system. The care taken over this storing and indexing of stocks is typical of Flather thoroughness.

Titanine Expansion

SATISFACTORY progress is being made in the expansion scheme now in hand at the Colindale (Hendon) works of Titanine, Ltd. The new buildings, which will almost double the size of the factory, will be completed shortly. They have been erected to cope with the increased demands for aircraft dope and cellulose and synthetic industrial lacquers.

The Industry (contd.)

ANTI-VIBRATION MOUNTINGS

Utilising New Rubber-to-metal Bonding Processes

DEVELOPMENTS which may have an important influence upon design and construction have recently been effected in the processes of bonding together rubber and metal. Two or three years ago there originated in America a process whereby rubber could be bonded to steel so effectively that the rubber would itself yield under test before the actual joint would give away. This process was made use of for producing flexible mountings for car engines.

More recently the bonding of rubber to metals and other substances has been the subject of considerable research in Germany and also in this country. Last August *Flight* described the intentions of Metalastik, Ltd., Evington Valley Road, Leicester, and it is now possible to reveal that this company is able to bond rubber not only to steel but to aluminium, Elektron, and even glass. It is expected that, in the near future, it will also be possible to bond rubber to such materials as Bakelite.

There are at present two methods of bonding rubber to other substances, the one being a direct process, and the other a process in which the metal is electrolytically plated. Hitherto there has been a certain amount of trouble in the direct bonding process; although the bond may be good at first, there is a tendency for it to deteriorate with the passage of time, due to corrosion occurring under the rubber. Improvements have, however, recently been effected which are likely to make direct bonding more satisfactory in the future, although the method must naturally be the subject of prolonged endurance tests before it can be felt that a sufficient degree of success has been achieved.

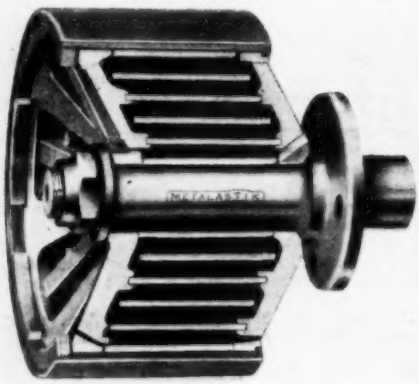
At present, therefore, a plating process of bonding is in use, the nature of the plating being part of a secret process. The fact, however, that rubber can now be bonded to light metals and alloys is of great importance to the aircraft industry, as it renders possible various forms of vibration-absorbing mountings. For example, engine mountings have been produced for both in-line engines and radial engines, while simpler forms of mountings are also being produced for instruments and for controls.

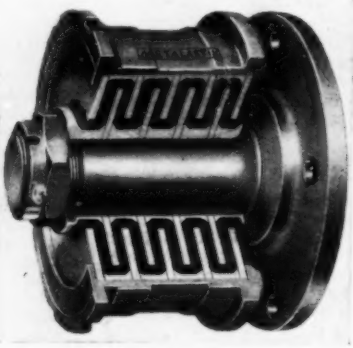
As regards engine mountings, it may be pointed out that the use of rubber, in conjunction with scientific design, enables practically any desired degree of vibration absorption to be obtained. The mixing of the rubber itself, and its resultant hardness, is one controlling factor, while the thickness of the rubber is another. Furthermore, the coupling may provide, in certain cases, for the rubber to receive support from adjacent metal surfaces as it becomes subjected to distortion under load. Such couplings are being applied to the mounting of airscrews, as well as to engines.

Again, whereas a simple mounting for a car engine may have the rubber in compression only, a more complicated form of mounting for an aircraft engine may make use of the rubber under compression, tension and torsion. Indeed, there would seem to be a very wide field of usefulness for these bonded rubber-metal fittings, for, obviously, they can be designed and used as shock-absorbing couplings for the transmission of power.

In producing some of the more intricate forms of mountings and couplings many difficulties had to be overcome, and a special high-pressure moulding process has been developed. This process has also made it possible to use not only natural rubber, but also synthetic rubber, which is impervious to the effects of oil and heat.

It will be realised that Metalastik, Ltd., have acquired considerable specialised knowledge in carrying out the developments recorded, and they are accordingly well qualified to give advice, and even to provide designs in any matter pertaining to the use of rubber-metal units.





Two types of Metalastik mountings for in-line engines.

NEW COMPANIES

In the notes below, for reasons of space, the "objects" of new companies are usually somewhat abbreviated.

AERIAL ADVERTISING COMPANY (GRIMSBY) LTD. Private company, registered December 16. Capital, £2,000 in 2,000 shares of £1 each. Objects: To acquire the business of aerial advertising carried on by H. B. G. Michelmore and R. A. C. Holme at Immingham, etc. The directors are: Herbert B. G. Michelmore (permanent chairman and managing director), air pilot; Richard A. C. Holme, air pilot. Solicitor: Alex Browne, 6, Town Hall Street, Grimsby.

MUMWARE, LTD. Private company, registered December 17. Capital, £3,000 in 60,000 shares of 1s. each. Objects: To carry on the business of manufacturers of and dealers in silencers for hollow-ware, dealers in all classes of metal and rubber articles and sundries, particularly such as relate to the silencing of such articles and the elimination of noise and of all kinds of waterproof materials; manufacturers of and dealers in motor and aeroplane accessories requiring rubber grips, silencers and tyres, rubber importers, etc. The first directors are: Valdemar Rendle, inventor and patentee; Joseph A. Richardson, patents developer; Millie Heading. Registered office: 4, Queen Victoria Street, London, E.C.4.

R. C. COCKBURN & COMPANY LTD.—Private company, registered December 31. Capital, £100 in £1 shares. Objects: To carry on the business of maintaining and operating aircraft and motor vehicles of all classes for hire, charter or taxi purposes, etc. The directors are Richard C. Cockburn and Mrs. Dorothy Cockburn Registered office: 38, Chancery Lane, London, W.C.2.

TERRELLS WIRE ROPES, LTD.—Private company, registered December 28. Capital, £3,000 in £1 shares. Objects: To carry on the business of wire rope manufacturers in Bristol and elsewhere; to adopt an agreement with Wm. Terrell and Sons, Ltd., for the purchase of certain plant, machinery and tools for the manufacture of wire ropes, together with certain other matters; to manufacture and deal in hawsers, cables and strands, netting, torpedo and aerial defence nets, mining and haulage plant, etc. Solicitors: Collins Woods & Vaughan Jones, 1, Worcester Place, Swansea.

JICWOOD LTD. Private company, registered January 8. Capital, £36,000 in 36,000 shares of £1 each. Objects: To carry on the business of manufacturers of and dealers in timber, sawn goods, compressed and artificial wood veneers, plywood, cements, glues and preparations for treating, impregnating, waterproofing and working in wood and similar substances, furniture, boats, containers, aeronautical goods and appliances, etc. The directors are: Capt. Frederick T. Swann, Dr. Henry C. Watts, John D. Titler and Richard Bradfield. Offices: Weybridge, Surrey.

PUBLICATIONS RECEIVED

Flags of All Nations, 1s. 6d. Brown, Son and Ferguson Ltd., 52-58, Darnley Street, Glasgow, S.1.

Annual Report of the Smithsonian Institution, 1936, $1.50 (cloth cover). Superintendent of Documents, Washington, D.C., U.S.A.

Soliloquies in the Bath, by F. Karinthy, 5s. Wm. Hodge and Co., Ltd., 86, Hatton Garden, London, E.C.1.

Aero and Auto Engine Facts and Data, by H. R. Langman, 2s. 6d. Technical Press Ltd., 5, Ave Maria Lane, Ludgate Hill, London, E.C.4.

Aircraft Propeller Handbook, by Karl Hansson Falk, $4.00. The Ronald Press Co., 15, East 26th St., New York, U.S.A.

Guide du Tourisme Automobile et Aerien au Sahara, 1938, Société Anonyme Francaise des Pétroles Shell, 46, Boulevard Camille Saint Saëns, Alger.

The Aircraft Bench Fitter by W. S. B. Townsend, 3s. 6d. Sir Isaac Pitman and Sons Ltd.

AERONAUTICAL PATENT SPECIFICATIONS.

(The numbers in brackets are those under which the Specifications will be printed and abridged, etc.):

(*Published January* 6, 1938).

16474. NAGLER, B: Flying machine (476,598).
16472. NAGLER, B: Rotary-wing systems for aircraft (476,596).
16473 NAGLER, B: Rotary-wing systems for aircraft (476,597).

(*Published January* 13, 1938).

6414. HOOVEN, F. J.: Radio direction-finding apparatus (476,721).
7490. GRAY, W. E.: Aeroplane wing flaps (476,673).
16713. KELVIN, BOTTOMLEY, & BAIRD, LTD., and RENFREW, D.: Apparatus for illuminating aircraft compasses (476,884).
16763. BINKS, C. L., and AMAL, LTD.: Fastening devices for aeroplane cowlings, and like covers (476,886).
17069. LINK, jun., E. A.: Apparatus for training aircraft pilots (476,816).
17109. MOSS, D. G. K., and PEIRCE, H. C. (trading as MECHANISM): Gyroscopic navigational instruments (477,012).
17472. JABLONSKY, B.: Variable-pitch airscrews (476,897).
12890. SIEMENS APPARATE UND MASCHINEN GES.: Variable-pitch propellers automatically regulated to constant speed (476,852).